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Observations on the Therapeutic Activity of Metamidium, Tozocide and Nucleocidin Against *Trypanosoma simiae* Infections in Pigs

BY

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SUMMARY.—1. *An account is given of experiments on the therapeutic activity of metamidium chloride, tozocide chloride and the antibiotic nucleocidin, against fly-transmitted* T. simiae *infections in domestic pigs.*

2. *None of these drugs was curative at the doses employed.*

3. *Metamidium chloride at* 3.0 *mg. per kg. cleared trypanosomes from the peripheral blood for* 5, 7 *and* 21 *days, and the same drug at* 6.0 *mg. per kg. cleared the blood for* 15, 25 *and* 32 *days. The relapse infections caused the death of* 2 *out of the* 3 *pigs in each group.*

4. *Tozocide chloride at* 4.0 *mg. per kg. and nucleocidin at* 0.05 *mg. per kg. had little effect on the course of the infections. All died within* 17 *days of being treated.*

THE domestic pig is potentially one of the most important sources of animal protein for human nutrition in the densely populated forest belt of West Africa, and it is well suited to this type of country, because it is relatively resistant to the majority of animal trypanosomes such as *Trypanosoma congolense, T. brucei* and *T. uniforme* (Hoare, 1936), and to *T. vivax* (Buxton, 1955, p. 669).

Cattle, other than the dwarf breeds, are not raised in these areas because of the shortage of grazing and the severe risk from infective tsetse-flies.

Unfortunately, however, the pig is extremely susceptible to *T. simiae*. Bruce, Harvey, Hamerton and Bruce (1913) fittingly described the disease in these words: "In the whole range of trypanosome diseases in animals there is surely nothing so striking as the rapidly fatal action of *T. simiae* on the domestic pig." An infected pig may show trypanosomes in its peripheral blood for only 24 hours before it dies. For this reason chemotherapy must be of secondary importance to prophylaxis. Nevertheless, there are times, for instance during an outbreak, when it would be necessary to treat infected animals before applying chemoprophylactic measures.

Very little progress had been made in the chemotherapy of *T. simiae* infections until Watson and Williamson (1958) reported that antrycide prosalt at 11.7 mg. per kg. and antrycide chloride at 50.0 mg. per kg. were curative. They also found that antrycide-suramin complex (Williamson, 1957) was therapeutically active even at doses as low as 5.0 mg. per kg.

Earlier efforts to control infections due to this trypanosome do not appear to have been particularly successful. Stewart (1936) reported the use of antimosan (a pyrocatechol complex of tervalent antimony) in an outbreak of *T. simiae* in pigs in the Gold Coast (Ghana), but the results were not followed up. However, in an outbreak at Minna in Northern Nigeria reported by Unsworth (1952), antimosan was ineffective. In syringe passaged infections, Wilson (1949, 1949a) found antrycide methyl sulphate to be curative at 3.0 to 5.0 mg. per kg. over a 6-month observation period; but 2.0 mg. per kg. of antrycide chloride gave rise to a strain of trypanosome resistant to antrycide methyl sulphate and the phenanthridinium compound, dimidium bromide. Unsworth (*loc. cit.*), however, treated a field outbreak with antrycide methyl sulphate at 3.0 to 5.0 mg. per kg. without success.

Guyaux (1948) reported that *T. simiae* in pigs responded to treatment with dimidium bromide at 1.0 mg. per kg., but this finding was not confirmed by Wilson (1948), or by Watson and Williamson (1958) when the latter tested the drug in infected splenectomised rabbits.

During an earlier experiment (Stephen & Gray, 1960) it was found that metamidium chloride (Wragg, Washbourn, Brown & Hill, 1958) possessed some therapeutic activity against *T. simiae* that had broken-through antrycide-suramin complex and antrycide chloride prophylactic treatments.

The experiments reported here were designed to test the therapeutic activity of metamidium chloride, tozocide chloride and the antibiotic nucleocidin against *T. simiae* infections in pigs. Austin, Collier, Potter,

Smith and Taylor (1957) found tozocide to be more active than antrycide against infections of *T. congolense* and *T. vivax* in mice when injected subcutaneously. The antibiotic nucleocidin possesses some therapeutic activity against *T. vivax* infections in cattle (Stephen & Gray, 1960).

Materials and Methods

Pigs. Fifteen Large White pigs were used in this therapeutic trial. They consisted of 3 mature and 12 young animals. Identification numbers were tattooed on the dorsal aspect of the left ear.

Husbandry. The pigs were kept under the same conditions of husbandry and management previously described (Stephen & Gray, 1960).

Routine Examinations. Rectal temperatures were taken daily, between 8 and 11 a.m. Wet blood films, using a drop of blood from a superficial ear vein, were examined daily (except Sunday) throughout the experiment; 60 microscopic fields ($\frac{1}{6}$ inch objective and $\times 8$ eyepiece) were examined on each occasion and parasitaemias were recorded as trypanosomes per 60 fields. Thin films were made on every occasion that wet films were positive, and were stained by Giemsa for trypanosome identification.

Each pig was weighed weekly on an accurate beam balance and examined clinically every day.

Drugs

(a) *Metamidium chloride*: Metamidium chloride is the *m*-amidinophenyl-diazo-amino-derivative of 2 : 7 diamino-10-ethyl-9-phenylphenanthridinium chloride (homidium chloride). A 2.0 per cent. solution in sterile distilled water was employed, at a dose rate of 3.0 and 6.0 mg. per kg. bodyweight.

(b) *Tozocide chloride*: Tozocide is the hydriodide of 6′-(4-quinaldylamino) hexyl-4-amino-quinaldinium iodide. A 2.0 per cent solution in sterile distilled water was employed at a dose rate of 4.0 mg. per kg.

(c) *Nucleocidin*: Nucleocidin is a crystalline antibiotic. It is produced by a new species of *Streptomyces, Streptomyces calvus,* isolated from a soil sample obtained in Dinepur, India. It has been shown to be a glucoside of adenine in which the carbohydrate moiety, stated to be of unusual structure, is bound in ester linkage to sulphamic acid (Waller *et al.*, 1957). A trial sample (Lot No. 3653B-130A) was received from Cyanamid International, American Cyanamid Company, Pearl River, New York.

A 0.1 per cent. solution in sterile distilled water was employed at a dose rate of 0.05 mg. per kg.

Infection. The pigs were infected by feeding wild-caught *Glossina morsitans* on them. Flies were caught in the Lumu fly-belt, by fly-boys from the Entomology Section of this Institute, and sent to Vom in chilled thermos flasks. They were then maintained in Bruce boxes during the period of feeding on the pigs. The Lumu fly-belt, which is 30 miles north-east of Kaduna, is an area where wart-hog (*Phacochoerus aethiopicus*) is plentiful and local tsetse are known to be infected with *T. simiae.*

The first batch of flies to be received was used to infect a mature control pig to ensure that *T. simiae* was present in them.

Treatment. The pigs were treated as soon as the infecting trypanosome could be identified in Giemsa-stained thin blood films. All drugs were injected subcutaneously, in the region behind the right ear.

Post-mortem *Examinations.* Careful autopsies were performed on all pigs that died during the course of the experiment.

Experimental Grouping. The pigs in the experiment were divided into 4 groups of 3 animals, as follows:—

I (3 pigs):	metamidium chloride	3.00	mg.	per	kg.
II (3 pigs):	„ „	6.00	„	„	„
III (3 pigs):	tozocide „	4.00	„	„	„
IV (3 pigs):	nucleocidin	0.05	„	„	„

Results

Infection. Every pig became infected with *T. simiae* within 5 days of the first fly feed. The prepatent period was 4 days in 3 pigs, and 5 days in 9 pigs. The mature control pig was infected 4 days after the first fly feed, and was killed *in extremis* after a fulminating infection lasting 3 days. Fly-dissections revealed the presence of *T. congolense* group infections in 2.9 per cent. of the flies.

Effects of Treatment

(a) *Therapeutic Activity*

(i) *Metamidium chloride.* Treatment with metamidium chloride at 3.0 mg. per kg. caused the trypanosomes to disappear from the peripheral blood within 24 hours in 1 pig only. The other 2 remained positive for 1 and 2 days after treatment. All 3 pigs in this group relapsed, after negative periods of 5, 7 and 21 days, and 2 died of the relapse infections. One died 19 days after treatment, of a heavy infection that lasted for 11 days; and the other died 50 days after treatment, of a chronic, intermittent infection in which the parasitaemia was heavy only in the terminal stages.

When 15.0 ml. of blood, from the latter pig, was inoculated into a clean pig, trypanosomes appeared in the peripheral blood 3 days later, and the animal died after only 6 days of parasitaemia. Trypanosomes were found in the blood of the third pig in this group for a period of 101 days after which it was apparently self-cured. Inoculation of 20.0 ml. of blood from this pig into a clean pig resulted in an infection in the recipient 4 days later and in death after a parasitaemia lasting only 9 days.

Metamidium chloride at 6.0 mg. per kg. cleared trypanosomes from the peripheral blood of all 3 pigs within 24 hours. This treatment did not cure the infections, however, and relapses occurred in 15, 25 and 32 days.

The pigs in this group continued to make normal weight gains for a month, but thereafter the relapse infections adversely affected their health and weights, and 2 died in 41 and 62 days after treatment. The third pig was infected for 60 days after treatment and as no trypanosomes were found after that time it was assumed to be self-cured.

(ii) *Tozocide chloride.* Tozocide chloride at 4.0 mg. per kg. did not clear the trypanosomes from the peripheral blood during the 24-hour period after

treatment. Individual animals were negative for periods of 1, 2 and 3 days during the first week after treatment, but trypanosomes reappeared and led to fulminating infections ending in death in every case. The pigs in this group died 7, 8 and 11 days respectively after treatment.

(iii) *Nucleocidin.* Nucleocidin at 0.05 mg. per kg. had very little effect on the infections. One pig was negative on the day after treatment, but the disease in all 3 pigs progressed rapidly and deaths occurred 4, 17 and 17 days respectively after administration of the antibiotic.

(b) *Reactions to Injections*

Metamidium chloride at 3.0 and 6.0 mg. per kg. caused only slight swellings at the injection site, and these regressed within a few days. No systemic toxicity at either dosage rate was noticed. The deaths and weight losses, particularly in the 3.0 mg. per kg. group, appeared to be due to the pathogenicity of the infecting organism alone.

Tozocide chloride caused a slight swelling and tenderness at the injection site, but this soon disappeared. It is not known whether the deaths in this group were due entirely to the trypanosome infections, or whether the drug had a contributory effect. Toxicity trials in normal pigs have not been carried out by us.

Nucleocidin caused no observable reaction at the injection site. One pig was seen to have an increased respiration rate 4 hours after treatment, but no other immediate signs of distress were noted.

Post-mortem examinations did not indicate whether drug toxicity had played a part in the deaths that followed treatment with tozocide and metamidium. The observed gross pathological changes in these carcases were mainly those that are associated with trypanosomiasis. However, the carcases of 2 of the pigs treated with nucleocidin were noticeably jaundiced.

At autopsy no damage was observed in the subcutaneous tissues in the region of the injection site of those pigs treated with tozocide and nucleocidin. The regional connective tissues and muscles of the pigs treated with metamidium were indurated and stained a purplish-red colour.

(c) *Temperature Reactions*

The mean rectal temperature of all groups of pigs rose to a maximum on the second day of infection, and in each case it was greater than 105° F. On the day of treatment the mean temperature of all groups was 105.6° F. By the second day after treatment the temperatures of the groups dosed with metamidium chloride at 3.0 and 6.0 mg. per kg. and the tozocide group had dropped to pre-infection levels. However, the pyrexial reaction in the group treated with nucleocidin was unaffected, and the mean temperature continued above the normal range until all were dead. The temperatures of the group treated with metamidium chloride at 6.0 mg. per kg. remained within normal ranges during the 20 days after treatment. But the group treated with metamidium chloride at 3.0 mg. per kg. showed a mean temperature rise above the pre-infection level on the eighth day after treatment, and these temperatures continued to fluctuate with the appearance of trypanosomes. The mean temperature of the animals treated with tozocide rose on the fifth day after treatment, and remained up until all pigs in the group were dead (see Fig. 1).

Clinical Observations

(a) *Initial* T. simiae *infections*

On the day that trypanosomes were first seen in the peripheral blood none of the pigs showed any clinical signs of illness other than a slight rise in body temperature. On the second day of infection, however, it was usually obvious that the pigs were

TABLE I.
THE RESULTS OF THERAPEUTIC EXPERIMENTS WITH TRYPANOCIDAL DRUGS AGAINST FLY-TTRANSMITTED *T. simiae* IN DOMESTIC PIGS

Group	Drug	Dose rate	Pig No.	Sex	Age (weeks)	Dose weight (kg.)	Dose Volume (ml.)	Challenged	Infected	Pre-patent period (dys.)	Treated	Duration of infection (dys.)	Days trypanosomes persisted in blood after treatment	Period to relapse after treatment (days)	Period from treatment to death (days)
I.	Metamidium Chloride 2% Solution	3.0 mg.per kg.	1024	M	28	47·7	7·2	20.5.59	25.5.59	5	26.5.59	1	2	8	19
			1026	F		48·2	7·2	23.5.59	28.5.59	5	29.5.59	1	1	9	Self-cure
			1028	F		49·5	7·4	25.5.59	30.5.59	5	1.6.59	2	0	22	50
II.	Metamidium Chloride 2% Solution	6.0 mg.per kg.	1033	F	21	25·5	7·6	13.7.59	18.7.59	5	20.7.59	2	0	32	Self-cure
			1036	M		26·4	7·9	14.7.59	18.7.59	4	20.7.59	2	0	25	41
			1037	M		26·7	8·4	15.7.59	20.7.59	5	25.7.59	5	0	15	62
III.	Tozocide Chloride 2% Solution	4·0 mg.per kg.	1025	F	28	49·1	9·8	21.5.59	25.5.59	4	26.5.59	1	1	3	11
			1027	M		45·5	9·1	24.5.59	28.5.59	4	29.5.59	1	1	5	8
			1029	M		50·9	10·2	26.5.59	31.5.59	5	1.6.59	1	1	4	7
IV.	Nucleocidin 0·1% Solution	0·05 mg.per kg.	1031	M	21	24·6	1·2	11.7.59	16.7.59	5	21.7.59	5	0	2	17
			1032	F		28·9	1·4	12.7.59	17.7.59	5	18.7.59	1	3	Never negative	4
			1038	M		24·3	1·2	16.7.59	21.7.59	5	22.7.59	1	3	5	17

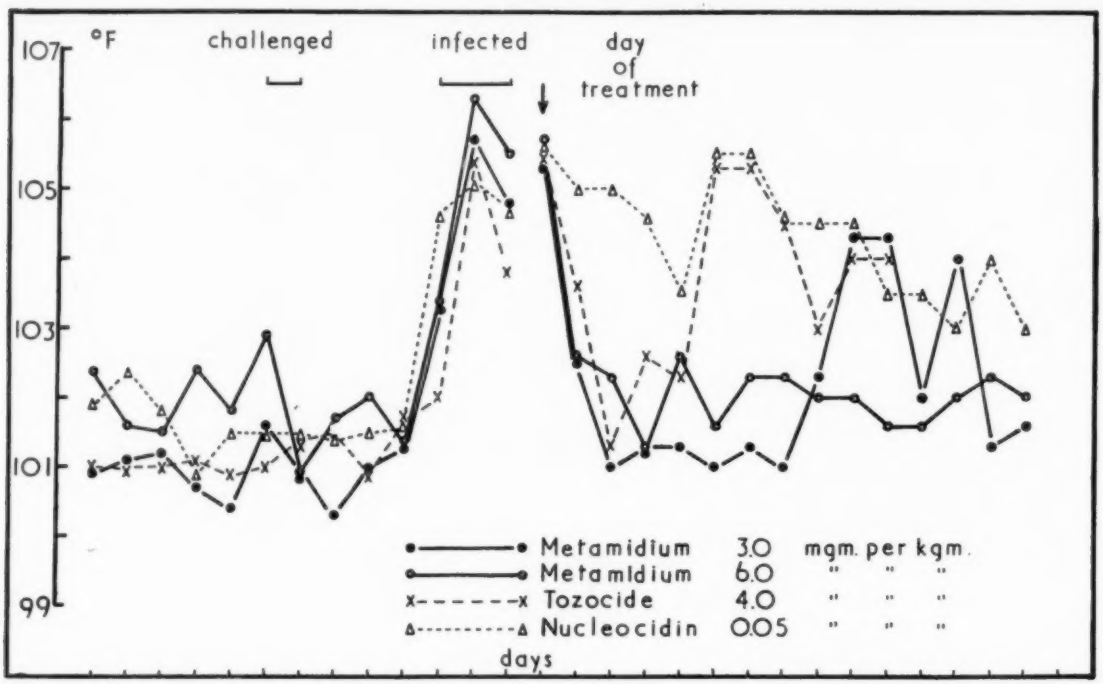

FIG. 1.—Temperature reaction in pigs infected with *Trypanosoma simiae;* and the effect of treatment with Metamidium chloride, Tozocide and Nucleocidin.

ill. The signs of illness were pyrexia; dullness; reduced appetite; decreased activity varying from a slight degree of stiffness and unsteadiness to a disinclination to rise; remaining hidden in the litter; and respiratory distress of variable severity. None of these signs is characteristic of trypanosomiasis only; they frequently accompany other pyrexial conditions in the pig.

(b) *Relapse Infections*

The signs of illness observed before treatment usually disappeared quite rapidly if treatment resulted in the clearing of trypanosomes from the peripheral blood. However, the reappearance of trypanosomes in relapse infections was almost always accompanied by signs of illness. Such infections are often characterised by a series of parasitaemic crises, during which the pig is quite ill, each followed by a period during which the animal's condition gradually improves. These chronic, relapse infections slowly progress; the animal has increasing difficulty during the recovery phase and finally dies in an exhausted state.

Discussion

Of the 3 drugs examined during these experiments, only metamidium chloride at 6.0 mg. per kg. appears to be of any practical therapeutic value. Although this treatment would not cure *T. simiae* infections in pigs, it appears that it would at least prevent immediate deaths and mechanical transmission by biting flies such as *Stomoxys, Tabanus* and *Haematopota* by temporarily clearing trypanosomes from the blood of infected pigs during the peak of an outbreak (*cf.* Unsworth, *loc. cit.*).

Pigs appear to tolerate metamidium chloride much better than cattle, since 10.0 mg. per kg. has been found to be lethal for White Fulani Zebu bulls; and the same drug at 5.0 mg. per kg. caused loss of weight during the first month after treatment and a moderately severe swelling at the injection site which persisted for about 6 weeks (Stephen, 1959). In the pig reaction swellings were negligible and appetite and weight gains were unaffected by the metamidium treatment at either of the dose rates employed. Weight losses did not occur until the appearance of the relapse trypanosome.

When this drug was administered intramuscularly at 2.0 mg. per kg. to pigs which were infected with *T. simiae* that had broken-through prophylactic doses of antrycide-suramin complex and antrycide chloride, the blood was cleared of trypanosomes within 24 hours (Stephen & Gray, 1960), whereas 3.0 mg. per kg., when given by the subcutaneous route to pigs with an initial infection with *T. simiae*, was not nearly so effective. Since metamidium caused extensive damage to the muscles it was necessary to change the route of administration from intramuscular to subcutaneous. The slower disappearance of trypanosomes from the peripheral blood after subcutaneous injection could have been due either to slower absorption or to the higher level of parasitaemia encountered in initial infections

(*Concluded at foot of page* 567)

0,0 dimethyl 2,2,2, trichloro 1-hydroxymethyl phosphonate,* 4-tert butyl-2-chlorophenyl methyl methylphosphoramidate† and 2-(β-methyoxyethyl pyridine)‡ in Bovine Ostertagiosis

BY

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SUMMARY.—The use in the field of three anthelmintics 0,0, dimethyl 2,2,2,trichloro-1-hydroxymethyl phosphonate, 4-tert butyl-2-chlorophenyl methyl methylphosphoramidate and 2-(β-methyoxyethyl pyridine) is described, the clinical results are evaluated and the effect of these agents on worm egg counts are tabulated.

It is concluded that the results indicate that all 3 drugs are efficient anthelmintics when Ostertagia *spp. are the principal parasites.*

No significant difference was found in the efficiency of the drugs used at the dosages employed.

* Neguvon: Bayer L13/59. † Ruelene: Dow Chemical Company. ‡ Promintic: Imperial Chemicals (Pharmaceuticals) Ltd.

Introduction

THE summer of 1960 was characterised by an unusually large number of outbreaks of parasitic gastro-enteritis in yearling cattle. Some of these outbreaks occurred within 14 days of the animals being turned out to grass in late May and early June. Cases continued throughout the summer and into the autumn only ceasing when the majority of the young stock were housed. Most of the affected animals ranged in weight from 3 to 4 cwt. with a few at 6 to 8 cwt.

Observations on the Therapeutic Activity of Metamidium, Tozocide and Nucleocidin Against *Trypanosoma simiae* Infections in Pigs.—*Concluded.*

as compared with the low grade parasitaemias found in previous break-through infections that were treated by the lower dose rate and by intramuscular injection.

The prolongation of life in the pigs treated with metamidium is interesting. One pig, treated with 3.0 mg. per kg., survived for 50 days and had an infection that began 22 days after treatment and continued sporadically, and occasionally with very high parasitaemia (up to 40 trypanosomes per microscopic field) for 28 days before it died. The same organism when inoculated into a clean pig caused an infection in which the parasitaemia was not higher than it was in the donor, and yet it killed the second host after only 6 days of infection. When 20.0 ml. of blood from the other pig in this group that had a chronic, intermittent, relapse infection lasting for 83 days was inoculated into a clean pig the recipient developed an acute infection and died in 9 days.

It is not known whether these drug-treated animals are temporarily protected from the harmful effects of the trypanosome by the presence of residual drug, or by an immunity reaction or by combination of these factors. The sub-inoculation experiments clearly demonstrated that the trypanosome was still pathogenic and had not become attenuated.

Thin blood films were taken from all stages of infections in these experiments and biometrical and morphological studies on the infecting trypanosomes are in progress. We are of the opinion that such studies are important because atypical forms of the trypanosome appear at times, and if these only were seen at any one time confusion could result.

Acknowledgments.—We wish to express our thanks to the members of the Entomology Section of W.A.I.T.R., Kaduna, for providing us with wild *G. morsitans*, and to our African Laboratory Assistants and herdsmen for their diligence and application during the experiment.

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The disease was sudden in its onset in the affected herds, the animals scouring badly and rapidly losing condition with marked inappetence, the worst affected showing a swaying gait when forced to move. Faeces samples showed high worm egg counts ranging up to 34,000 eggs per gramme of faeces. Two animals were examined *post mortem* in early June. The lesions were confined to the abomasum in both, the folds being markedly oedematous and studded with tiny petechiae and minute haemorrhagic ulcers, while the mucosa between the folds was thickened and covered with small fibrous nodules (morocco leather stomach).

Worm counts showed burdens of 25,000 and 35,000 parasites respectively in the abomasum, the worms being identified as mature and developing *Ostertagia* species. In addition the small intestine of one animal had 5,000 mature and immature *Ostertagia* while in both there were a few *Trichostrongylus axei* and *Nematodirus* spp. The condition was therefore diagnosed as ostertagiosis.

That *Ostertagia* spp. played the major rôle in most outbreaks throughout the period was confirmed by further *post-mortem* examinations carried out throughout the summer but late in the autumn, *Cooperia* appeared in sufficient numbers to be important. The worm counts obtained on *post-mortem* examinations are shown in Table I.

TABLE I
WORM COUNTS FROM *Post-mortem* EXAMINATIONS

Post mortem	Abomasum Total worms	Small Intestine Total worms
No. 1	25,000 *Ostertagia* spp.	5,000 *Ostertagia* spp.
No. 2	35,000 *Ostertagia* spp.	Few immature worms
No. 3	15,000 *Ostertagia*, 500 *T. axei*	2 000 immature worms
No. 4	30,000 *Ostertagia* spp. 1,000 *T. axei*	2,000 *Cooperia*
No. 5	1,500 *Ostertagia* spp.	80,000 *Cooperia* 7,000 *Ostertagia*
No. 6	75,000 *Ostertagia* spp.	11,500 *Ostertagia* spp.

In most of the outbreaks the condition had been diagnosed as parasitism by the practitioner on clinical grounds often supported by faecal egg counts. The animals had therefore been dosed with phenothiazine and in some herds piperazine was tried when phenothiazine failed to give a clinical cure. Phenothiazine dosing resulted in a drop in the faecal egg counts in most cases.

0,0, *dimethyl* 2,2,2, *trichloro*-1-*hydroxymethyl phosphonate*

The organo-phosphorus drug 0,0, dimethyl 2,2,2, trichloro-1-hydroxymethyl phosphonate (Neguvon) having been reported to be an efficient anthelmintic in cattle (Levine, Ivens, Kleckner & Sonder, 1956; Banks & Michel, 1960; Riek & Keith, 1958), a supply of this drug was obtained through the courtesy of the Cooper Technical Bureau and 2 badly affected herds were treated. The dose used was 50 c.c. of an 8 per cent. solution per cwt. bodyweight (80 mg. per kg.) given orally. Individually numbered faeces samples were taken from all the animals at dosing and again 7 days later. In the larger herd (Table II) 3 groups were formed, Group I being dosed with Neguvon, Group II with phenothiazine while the third group was kept as an undosed control. At the 7-day sampling clinical improvement was noticeable only in the Neguvon dosed group, so the phenothiazine and control groups were dosed with Neguvon. Thereafter recovery in all groups occurred with a quick return of appetite.

The animals in the second herd (Table III) had been affected for some 5 weeks and had been dosed with phenothiazine and piperazine and as they were still very badly affected it was decided not to keep controls. The whole group was therefore dosed. Repeat samples were obtained at 21 days as well as 7 days after dosing. Recovery was striking, the animals showing marked clinical improvement within 7 days. Scouring ceased within 48 hours and the animals regained their appetites and licked themselves.

In both herds the worm egg output was markedly reduced.

TABLE II
HERD 1
(eggs per gramme faeces)

NEGUVON GROUP e.p.g.		CONTROLS		PHENOTHIAZINE GROUP e.p.g.	
		e.p.g.			
Before dosing	7 days after dosing	Initial	7 days	Before dosing	7 days after dosing
1,200	Nil	500	1,700	1,100	200
300	100	900	3,400	3,300	1,300
700	Nil	900	1,400	700	600
600	100	1,500	700	500	1,500
1,200	600	500	400	1,200	1,600
2,000	300			1,000	500

TABLE III
NEGUVON
HERD 2
(eggs per gramme faeces)

Animal number	w.e.c. before dosing	6 days after dosing	15 days after dosing
A1	1,500	Nil	Nil
A3	2,300	Nil	Nil
A4	7,100	Nil	Nil
A6	700	Nil	Nil
313	1,100	Nil	Nil
314	300	Nil	Nil
316	500	Nil	Nil
220	1,500	Nil	Nil
321	5,200	Nil	Nil
A5	Not sampled	Not sampled	2,200

The calf A5 was an inadvertent control having been missed at the dosing.

These results being satisfactory and unattended by any toxic side-effects (Gordon, 1958), other herds were treated with the drug. As Neguvon appeared to be effective it was considered that the keeping of controls was not justified, the disease resulting in such a rapid deterioration in the condition of the affected animals. The drug was therefore issued to practising veterinary surgeons in the area for trial, on clinical evidence supported by preliminary faeces samples. Individually numbered faeces samples were requested at dosing and at 7 days after dosing. Clinical reports

were requested at 21 days. In all, some 150 animals were dosed with Neguvon but the requisite faeces samples were obtained from only 52.

Results

No cases of toxicity were observed following the use of the drug.

Clinically the results were excellent following the pattern already described above for the first 2 herds. The reduction in the worm egg output was significant and consistent with the exception of one herd, the results of which are shown in Table IV. This herd was composed of heavier animals and it is thought that as a result they were under-dosed. The clinical response in this herd was, however, excellent.

The worm egg counts in the other herds treated were reduced in most instances to 400 eggs per gramme or less, regardless of the initial counts and fully support the clinical findings. This drug therefore is an effective parasiticide in the bovine against *Ostertagia* spp. In Table V the numbers of animals in which the count was reduced from an initial count of over 700 e.p.g. faeces to 400 e.p.g. or less are tabulated.

TABLE IV

UNDER-DOSED HERD. WORM EGG COUNTS AS EGGS PER GRAMME FAECES

Animal number	Before dosing	7 days after dosing	Animal number	Before dosing	7 days after dosing
1	400	500	9	800	1,400
2	800	600	10	1,100	1,700
3	11,100	300	11	200	800
4	2,500	1,000	12	300	600
5	100	1,200	13	400	300
6	3,000	4,100	14	2,400	100
7	600	200	15	8,800	Nil
8	200	600			

TABLE V

SUMMARY OF RESULTS OF DOSING WITH NEGUVON

Number of animals with initial counts over 1,500 e.p.g.	Number reduced to less than 400 e.p.g.
24	20
Initial counts 700 to 1,500 e.p.g.	**Number reduced to less than 400 e.p.g.**
9	6

Tables VI, VII, and VIII show the individual counts before and after dosing grouped according to their initial levels.

These results show how constantly a significant reduction was produced in the faecal egg counts. The most notable exceptions will be seen to come from the herd illustrated in Table IV.

4-tert-butyl-2-Chlorophenyl methyl methylphosphoramidate (Ruelene)

In a personal communication the Dow Chemical Company stated that this drug had been shown in field trials and in the laboratory to have a wide parasiticidal activity in cattle, sheep and goats. The compound was supplied for trial by the makers as a 25 per cent. dispersible powder for oral dosing.

TABLE VI

INDIVIDUAL COUNTS

Animal No.	Initial counts over 1,500 e.p.g. faeces	7 days after dosing with Neguvon	Animal No.	Initial counts over 1,500 e.p.g. faeces	7 days after dosing with Neguvon
1	1,600	300	13	1,500	Nil
2	2,400	500	14	5,200	Nil
3	5,000	200	15	2,100	200
4	4,600	500	16	2,400	100
5	11,100	300	17	8,000	Nil
6	2,500	1,000	18	2,900	100
7	3,000	4,100	19	3,600	100
8	2,400	100	20	2,100	100
9	8,000	Nil	21	12,300	Nil
10	1,500	Nil	22	6,600	Nil
11	2,300	Nil	23	10,000	Nil
12	7,100	Nil	24	34,200	100

TABLE VII

Initial counts 700 to 1,500 e.p.g. faeces	7 days after dosing with Neguvon	Initial counts 700 to 1,500 e.p.g. faeces	7 days after dosing with Neguvon
900	400	1,100	Nil
800	600	1,200	200
800	1,400	800	Nil
1,100	1,700	1,000	200
700	Nil	900	300

TABLE VIII

Initial counts below 700 e.p.g. faeces	7 days after dosing with Neguvon	Initial counts below 700 e.p.g. faeces	7 days after dosing with Neguvon
400	200	400	300
100	Nil	300	Nil
300	800	500	Nil
100	1,200	500	Nil
600	200	300	Nil
200	600	300	Nil
200	800	100	100
300	600	100	Nil

The dosage as suggested by the makers was approximately 2 grammes of the active drug per 100 lb. bodyweight and this level of dosage was used throughout the trials.

In the first herd treated the animals had developed scour 10 to 14 days after having been moved to a different field. They were dosed with phenothiazine without clinical response. *Post-mortem* examination of one animal showed the typical morocco leather stomach of chronic ostertagiosis and there was a heavy infestation (25,000) of *Ostertagia* spp. in the abomasum. The animals were divided into 2 groups, 12 being dosed with Ruelene and 8 with phenothiazine. No. 8 of the Ruelene group was very weak when dosed and died 2 days later. Faeces samples were taken at the time of dosing and at 5, 10, and 21 days later. The phenothiazine group was dosed with Ruelene 10 days after the phenothiazine dosing since the clinical picture was unchanged. The results are tabulated in Tables IX and X.

TABLE IX
RUELENE GROUP
WORM EGG COUNTS FROM THE FIRST HERD
(eggs per gramme faeces)

No.	Before dosing	5 days after dosing	10 days after dosing	21 days after dosing
1	2,000	Nil	Nil	200
2	3,700	300	Nil	300
3	200	Nil	400	100
4	3,300	Nil	Nil	200
5	2,700	Nil	300	Nil
6	5,200	Nil	200	Nil
7	300	Nil	Nil	100
9	7,300	300	200	300
10	4,300	600	900	100
11	1,700	Nil	100	Nil
12	2,300	100	700	300

TABLE X
PHENOTHIAZINE GROUP, 1ST HERD.
(eggs per gramme)

No.	Before dosing with Phenothiazine	5 days after dosing	10 days (dosed Ruelene) on this day	5 days after dosing Ruelene	10 days after dosing Ruelene
13	1,100	Nil	200	Nil	Nil
14	1,900	1,100	1,200	100	100
15	3,000	400	Nil	100	100
16	3,600	1,700	1,900	Nil	Nil
17	2,100	100	300	Nil	Nil
18	4,500	500	Nil	Nil	Nil
19	1,900	Nil	100	Nil	100
20	4,200	900	500	Nil	Nil

The Ruelene dosed group slowly improved after dosing, scouring ceasing in 5 days; by 21 days a distinct clinical improvement was observed and this was maintained. The phenothiazine dosed group improved similarly after dosing with Ruelene. The rather slow recovery was perhaps to be expected in view of the chronic changes seen in the abomasum of the animals which died.

Some 150 animals were dosed with Ruelene. The results were similar to those obtained when Neguvon was used, recovery in some cases being spectacular. Faeces samples taken before and after dosing numbered 74 out of the 150 animals dosed.

The effect of Ruelene on the worm egg output of these animals is shown in Tables XI, XII, XIII, and XIV.

Toxicity

In one instance four animals showed signs of discomfort. These signs passed off within an hour of treatment.

Results

It was shown that Ruelene was effective in producing a clinical cure in animals affected with ostertagiosis. The animals generally showed a marked improvement within 7 days of dosing, this period being lengthened in the longer standing cases to 14 to 21 days though scouring with few exceptions ceased within 3 to 4 days of dosing. As will be seen from the tables the reduction in the faecal worm egg

TABLE XI
SUMMARY OF RESULTS OF DOSING WITH RUELENE

Initial counts of 1,500 e.p.g. or more	Number reduced to 400 e.p.g. or less
34	29

TABLE XII
INDIVIDUAL ANIMALS WITH INITIAL COUNTS OF 1,500 EGGS PER GRAMME OR MORE
(eggs per gramme faeces)

Before dosing	7 days after dosing with Ruelene	Before dosing	7 days after dosing with Ruelene
49,000	200	4,500	300
3,200	Nil	2,400	1,100
1,600	100	1,500	300
2,000	100	1,800	1,300
1,800	Nil	2,300	Nil
4,500	100	6,000	Nil
1,900	Nil	1,500	400
19,200	900	2,000	Nil
6,800	Nil	3,700	Nil
9,200	400	3,300	Nil
5,000	200	2,700	300
5,100	Nil	5,200	200
3,600	17,200	7,300	200
5,100	1,100	4,300	200
1,900	300	1,700	100
8,300	900	2,300	700
2,100	200	1,900	Nil

TABLE XIII
INITIAL COUNTS 700 TO 1,500 EGGS PER GRAMME FAECES

Before dosing	7 days after dosing with Ruelene
700	Nil
800	200
800	Nil
1,100	600
1,300	100
700	Nil
1,200	100

TABLE XIV
INITIAL COUNTS LESS THAN 700 EGGS PER GRAMME RUELENE
(eggs per gramme faeces)

Before dosing	7 days after dosing with Ruelene	Before dosing	7 days after dosing with Ruelene
100	Nil	400	Nil
300	Nil	400	Nil
600	Nil	400	Nil
300	Nil	200	Nil
200	200	100	Nil
500	Nil	500	Nil
400	Nil	200	400
600	100	300	Nil
500	900	200	Nil
500	200	Nil	100
400	100	300	Nil
500	600	Nil	Nil
300	Nil	100	Nil
600	100	500	Nil
Nil	100		

counts is similar to those which were obtained with Neguvon. Though it was not possible to keep controls the number of faeces samples examined and the consistent reduction in the number of eggs present are sufficiently conclusive. These counts show no significant difference from the counts obtained after dosing with Neguvon. The drug therefore is effective against ostertagiosis in the bovine.

2-(β-methyoxyethyl) pyridine (Promintic)

This drug was reported to be active as a parasiticide in calves and sheep by Walley (personal communication) and the drug was made available to us in September, 1960, by the Pharmaceuticals Division of Imperial Chemical Industries. The dose given was 10 ml. per estimated cwt. bodyweight injected subcutaneously with a maximum dose of 40 ml. The majority of the animals treated weighed 2½ to 4 cwt.

Two herds were treated in the first instance. In one herd (Table XV) it was possible to keep controls which were dosed with Promintic 7 days after the first dosing. In this herd 3 animals were slaughtered at 7 days after the first dosing, 2 being taken from the dosed group and 1 from the control group. The results of worm counts in these animals are shown in Table XVI. The drug proving successful no controls were kept in the second herd. The effect of dosing on the worm egg output in this herd is recorded in table XVII.

TABLE XV

HERD 1. WEIGHTS 3 to 5 CWT. ANIMALS HOUSED AT DOSING

Animal No.		Egg per gramme faeces at initial sampling	At 7 days (dosed) Promintic	3 months
Controls Undosed	1	2,600	1,300	Nil
	2	1,000	Nil	Nil
	3	900	200	Nil
	4	2,100	1,100	Nil
	5	1,800	700	Nil
	6	2,700	1,200	Nil
	7	2,300	2,000	Nil
	8	2,100	2,200	Nil
	9	2,900	1,200	Nil
			Seven days after dosing with Promintic	
Promintic Dosed	1	700	Nil	Nil
	2	300	Nil	Nil
	3	1,300	Nil	Nil
	4	1,000	Nil	Nil
	5	4,000	800	Nil
	6	300	Nil	Nil
	7	2,500	Nil	Nil
	8	2,400	Nil	Nil
	9	7,500	Nil	Nil

As was the case with the other 2 drugs tested many more animals were treated than were recorded with faecal egg counts before and after dosing. More than 300 animals were treated with Promintic but of this total only 108 animals in 17 herds were supported by the necessary faeces samples. The totals showing counts of over 700 e.p.g. before dosing and the number reduced to 400 e.p.g. or less are recorded in Table XVIII.

TABLE XVI

W.E.C. AND TOTAL WORM COUNTS IN ANIMALS SLAUGHTERED 7 DAYS AFTER DOSING DATE (eggs per gramme faeces)

Animal number	Worm egg count before dosing	Worm egg count at 7 days post dosing	Abomasal worm count	Small intestine worm count
1. Dosed Promintic	2,300	Nil	No worms	Nil
2. Dosed Promintic	2,400	Nil	200 *ostertagia*	Nil
3. Control Undosed	1,000	1,200	30,000 *ostertagia*	2,000 *Cooperia*

TABLE XVII

Herd II. PROMINTIC (eggs per gramme faeces)

Animal number	Before dosing	14 days after dosing with Promintic	3 months
1	500	Nil	Nil
2	800	300	Nil
3	3,600	400	Nil
4	6,200	Nil	Nil
5	2,800	Nil	Nil
6	13,500 (died)	—	—
7	900	Nil	Nil
8	1 000	100	Nil

TABLE XVIII

SUMMARY OF RESULTS OF DOSING WITH PROMINTIC

Initial counts over 1,500 e.p.g.	Number reduced to 400 e.p.g. or less
41	35
Initial counts 700 to 1,500 e.p.g.	**Number reduced to 400 e.p.g. or less**
41	38

The full records showing the effect of dosing on the worm egg output in the individual animals are shown in Tables XIX, XX, and XXI.

Results

Injection of Promintic resulted in a cessation of scouring in 3 to 4 days with clinical improvement visible in 7 to 21 days. The time taken for a clinical "cure," apparently bore some relation to the duration of symptoms as appeared to be the case with the other drugs tested. There was no measurable difference in the effect of Promintic, Neguvon and Ruelene. The tables showing the effect on worm egg output of dosing with Promintic again support the clinical findings and show that over 80 per cent. of the animals dosed have the counts reduced to 400 e.p.g. or less. That this reduction was the result of parasitidal action and not of suppression of egg laying is supported by the results in the 2 *post-mortem* worm counts carried out after dosing. Promintic is therefore considered to be an effective parasiticide in the bovine.

Toxicity

Three of the 300 animals dosed showed toxic effects which could be ascribed to the drug. All were animals in very weak condition and became recumbent after injection remaining down for 3 weeks. During this period they ate well and improved in condition and when they finally rose no ill effects were apparent. These animals would undoubtedly have died without treatment.

TABLE XIX

ANIMAL SHOWING INITIAL COUNTS OVER 1,500 EGGS PER GRAMME FAECES
PROMINTIC

Before dosing	7 days post dosing	Before dosing	7 days post dosing
2,000	100	3,300	Nil
2,200	300	7,300	100
5,600	Nil	3,900	200
4,000	800	7,600	Nil
2,500	Nil	7,000	400
2,400	Nil	2,200	400
7,500	Nil	3,300	700
3,600	400	2,900	100
6,200	Nil	2,100	800
2,800	Nil	2,800	500
13,500	Nil	2,400	700
2,300	Nil	2,500	700
9,900	Nil	2,900	Nil
2,600	100	13,300	400
2,700	200	2,800	300
1,600	Nil	1,800	200
1,600	Nil	1,800	100
1,800	Nil	1,600	Nil
1,700	300	1,600	300
1,600	Nil	1,500	Nil

TABLE XX

COUNTS OF 700 to 1,500 EGGS PER GRAMME FAECES
PROMINTIC

Before dosing	7 days post dosing	Before dosing	7 days post dosing
1,300	Nil	1,200	100
1,300	400	1,200	100
1,200	Nil	1,000	Nil
1,300	Nil	1,400	300
1,300	Nil	1,000	100
1,300	Nil	1,100	Nil
1,000	Nil	1,400	300
1,000	100	1,100	200
1,700	Nil	1,100	100
1,400	100	1,200	Nil
1,000	Nil	1,100	100
1,100	100	1,200	Nil
1,100	100	1,300	400
800	100	900	100
800	Nil	800	400
800	100	700	200
700	Nil	700	100
800	300	800	500
900	Nil	800	100
800	Nil	900	100
800	800	700	Nil

Discussion

Rapid recovery of affected animals and the effect on the faecal egg counts indicate that the 3 drugs tried are effective in the treatment of *Ostertagia* in cattle. It is difficult to assess the value of faecal worm egg counts in experiments of this type unless considerable numbers of both treated and control animals are used. It is known that the daily worm egg output of the individual animal can vary considerably and an added difficulty is that many of the predosing samples are taken from animals with profuse diarrhoea which considerably dilutes the sample, while the post dosing samples are mostly firm and therefore much more concentrated. The fact, however, that with all 3 drugs very few samples showed a rise in the egg count while over 80 per cent. showed a significant reduction is further evidence that the 3 anthelmintics used are effective in treating bovine ostertagiosis.

TABLE XXI

COUNTS OF LESS THAN 700 EGGS PER GRAMME FAECES
PROMINTIC

Before dosing	7 days post dosing	Before dosing	7 days post dosing
500	300	500	Nil
600	100	500	500
500	Nil	500	500
600	600	600	200
400	200	400	500
400	700	600	300
500	Nil	600	Nil
500	Nil	600	100
400	Nil	400	200
500	100	600	Nil
600	Nil	400	200
500	Nil	400	100
400	400	600	Nil

Although it was not possible to keep adequate untreated controls in outbreaks where a fairly high mortality rate was likely, such controls as could be kept indicate that the fall in worm egg output was the result of the drugs alone. The second samples were taken at 7 days to lessen the chance that other factors might influence the counts. Those cases which were followed up for more than a month indicated that the drop in the egg output was in fact due to death of the worms and not to inhibition of egg laying and worm counts in the few animals which could be examined at *post-mortem* after dosing confirmed this, worms being virtually absent.

In several herds the drugs were compared by dosing half the animals with one drug and half with another. In no case did the clinical response or the faecal egg counts indicate any significant difference in their efficiency.

Acknowledgments.—Our thanks are due to the practitioners who co-operated in this trial, to our colleagues who helped with egg counts and *post-mortem* examinations, and to Drs. Campbell and Dunn who identified the worms present.

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J. S. A. SPREULL.—EXCISION ARTHROPLASTY AS A METHOD OF TREATMENT OF HIP JOINT DISEASES IN THE DOG

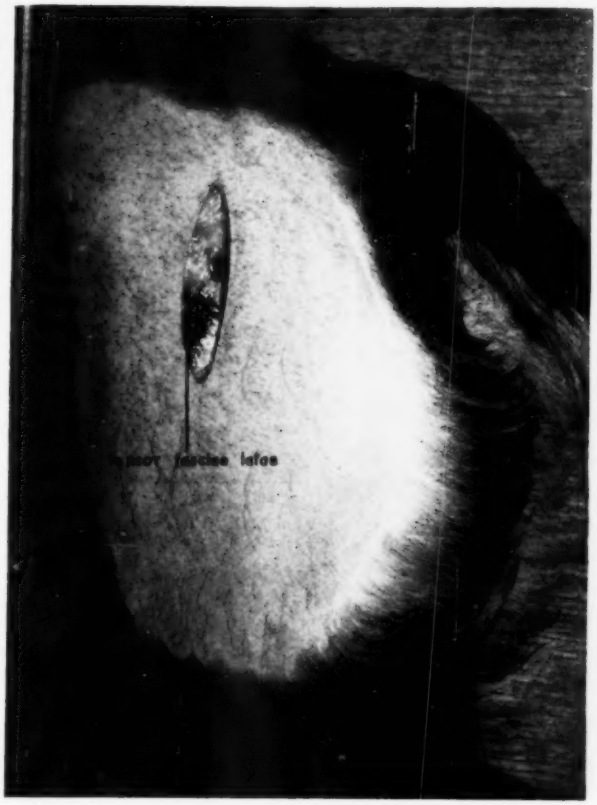

FIG. 1

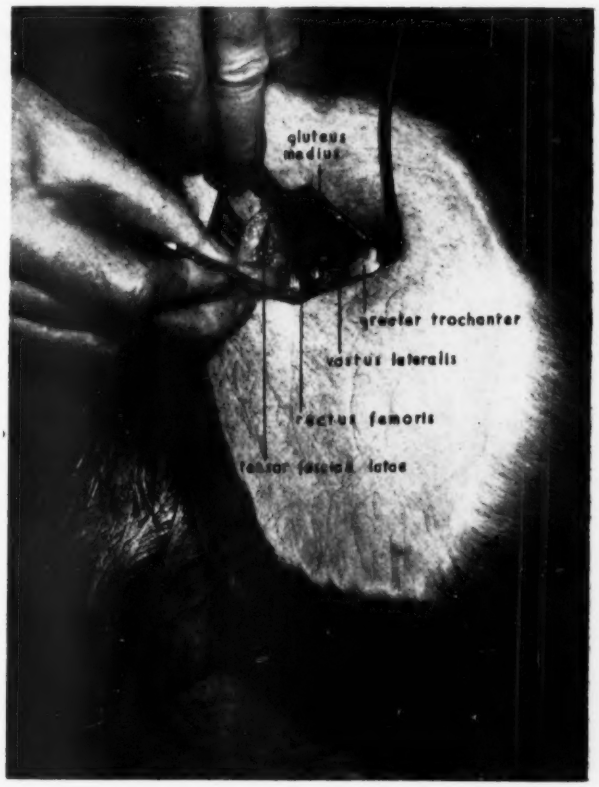

FIG. 2

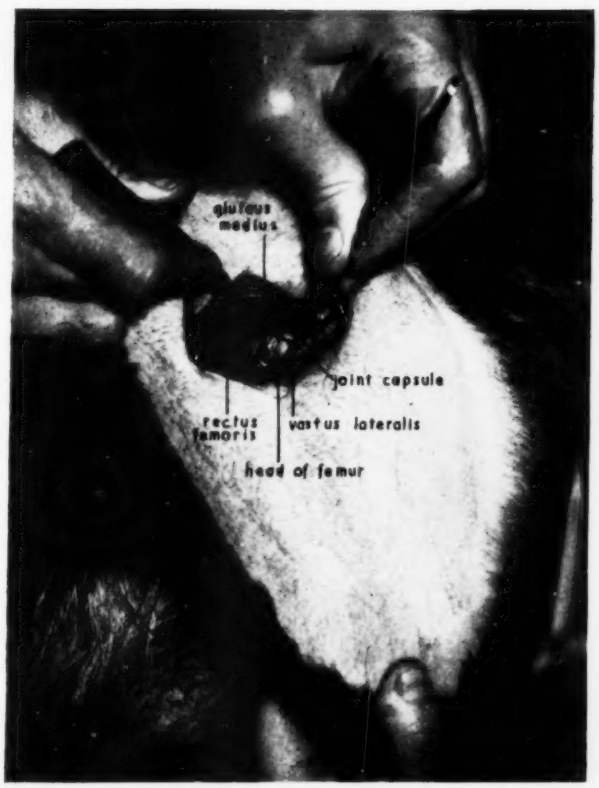

FIG. 3

FIG. 4

FIG. 5

FIG. 6

FIG. 7

Excision Arthroplasty as a Method of Treatment of Hip Joint Diseases in the Dog

BY

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SUMMARY.—A surgical procedure which has given encouraging results in the treatment of a variety of hip joint diseases of the dog is discussed and described.

A NUMBER of conditions of the hip joint are now recognised and described in the dog: most of them respond to orthodox methods of treatment but not all, and many of these failures cause crippling lameness in both young and adult animals.

A review of 66 cases of hip lameness showed that 59 responded favourably to expectant (non-operative) or orthodox treatment and 7 failed to make a satisfactory recovery. The cause of lameness in the 66 dogs reviewed was as follows: 40 showed aseptic necrosis of the head and neck of the femur (also referred to as Perthes' disease and as osteochondritis), 13 were traumatic luxations, 5 were fractures of the neck of the femur, 3 were diagnosed as arthritis or osteoarthritis, 2 animals suffered from fracture of the acetabulum, and 3 were cases of hip dysplasia.

The 7 cases that failed to respond to treatment were represented as follows: 2 cases of aseptic necrosis of the head and neck of the femur, 1 case of traumatic luxation of the hip, and 1 case of traumatic fracture of the neck of the femur; 1 animal suffered from what was diagnosed as arthritis, 1 suffered from fracture of the acetabulum, and the seventh animal suffered from bilateral hip dysplasia. All were treated by excision arthroplasty.

Brief Case Records

Case No. 1. Brindle Cairn Terrier dog, 18 months old. This case was referred to the writer after the animal had been lame on the left hind leg for some 9 months, during which time the condition became worse in spite of treatment. The lameness was such that the paw merely touched the ground occasionally. Wasting of the gluteal mass and the extensor muscles of the hip was evident by hollows above and behind the hip joint, resulting in the greater trochanter appearing more prominent. Pain seemed to be acute but was difficult to assess, because the animal was both nervous and vicious. X-ray examination revealed advanced rarefaction of the head and neck of the femur. From a consideration of the history, the animal's physical state and the X-ray evidence, it seemed unlikely that satisfactory reparation could ever occur. In view of this, excision arthroplasty was performed. The dog was discharged from hospital on the eleventh post-operative day showing little change in the state of lameness. Due to his temperament no physiotherapy exercises were given or advised. The owner reported regular steady improvement. On the third week after discharge from hospital the animal was walking well and on the fourth week he was virtually sound. The operation was performed in 1949 and since then the dog has had normal use of the leg. He is now 13 years old.

Case No. 2. West Highland White Terrier dog, 10 months old. This animal had for 3 months become progressively more lame on the right hind leg, but the limb was still in use and bearing some weight. Some muscular wasting was evident, particularly above and behind the greater trochanter. During his lameness he was treated by monthly injections of vitamin D concentrate and by the administration of bonemeal mixture and cod-liver oil emulsion.* X-ray examination revealed rarefaction of the head and neck of the femur. The owner elected to have it operated upon. The animal was discharged from hospital on the fourth post-operative day and was reported to be walking well in 2 weeks' time. The operation was performed in 1952 and the animal is sound, fit and well to date.

Case No. 3. Black-and-white Scottish Collie bitch, 6 years old. As a result of a road accident this animal had sustained fractures in both fore limbs, the right one at the midshaft of the radius and ulna and the left at the distal epiphysis of the radius and ulna: the left femur was fractured at midshaft and the right hip was dislocated. The fore limb fractures were reduced and set in plaster: the femoral fracture was reduced and fixed by an intramedullary pin. The dislocation was reduced, but within 24 hours it again became displaced. It was reduced on this occasion and once again, 3 days later. Within 24 hours it was again out of place and on this occasion advice was given to the owner to exercise the limb in order to promote the formation of a false joint.† Three months later the animal still showed marked pain on manipulation of the right hip and suffered from crippling lameness in

* The dose of vitamin D concentrate (Burroughs Wellcome) was 1 c.c. (0.5 million units of D_2) administered intramuscularly. The bone meal mixture consisted of sterilised meat and bone meal, 16 parts; calcium phosphate, 4 parts; calcium carbonate, 1 part. A half teaspoonful (30 gr. or 2 gm.) of the powder was given twice a day in food. The cod liver oil emulsion was as follows: Extract of red bone marrow, 1 oz. (30 gm.), extract of malt, 1 oz. (30 gm.), 20 per cent. solution of calcium gluconate, 1 oz. (30 gm.), compound syrup of iron phosphate, 1 oz. (30 gm.), lime water, 3 oz. (90 gm.), and cod liver oil, 5 oz. (150 gm.). A teaspoonful (60 m. or 4 gm.) was given twice a day.

† The owner is advised to move the joint by gently flexing and extending it and then by rotating it for some 10 minutes twice a day. The degree of movement and the duration of treatment is increased each day and continued as required.

this limb. The head of the femur was then excised and the animal discharged when the stitches had been removed ten days after operation. Her lameness was reported as improving progressively. The arthroplasty was performed in 1954 and the animal, because of senility, was destroyed in 1958. For these 4 years the limb caused no further trouble or lameness.

Case No. 4. Tan-and-white Shetland Collie dog, 8 months old. In this case the right hind leg had been damaged by a tractor trailer 2 months previously, lameness was marked and there had been no improvement since the accident. Movement of the hip joint was restricted and caused marked pain. X-ray examination showed that an impacted fracture of the neck of the femur had healed, resulting in a shorter and thickened neck. Muscular wasting around the joint was evident. Excision arthroplasty was performed and the animal was sent home on the 14th post-operative day when he was taking slight weight on the limb. Advice was given regarding the application of remedial exercises if progress was not satisfactory. A report was received 2 months later which stated that the dog had made a good recovery without resort to the "drastic measures advised." A further letter was received 1 month later stating that there had been "a completely successful outcome to the operation."

Case No. 5. Black Labrador dog, 3 years old. This animal was a valuable, first-class gundog. Lameness in the left hind leg had been observed for about 1 year and, becoming progressively worse, it had prevented the animal from working for some 4 months. Clinical examination revealed muscular wasting around the left hip, pain on manipulation and a restricted range of movement of the joint. X-ray examination revealed that the head of the femur was rarefied, the acetabulum appeared to be similarly affected and a "fuzzy" exostosis was present on the head and neck. The right hip joint appeared to be similarly affected but to a much less degree. Excision arthroplasty was performed on the left joint. One month later the animal still showed no willingness to use the limb. After a further month of lameness, muscular wasting, swelling and pain were all increasingly evident. Further X-ray examination revealed a well-marked, very dense, bony enlargement on the neck of the femur. In addition, very obvious deterioration had occurred on the right hip. The animal was destroyed.

Case No. 6. Golden Cocker Spaniel, young adult bitch. As a result of a road accident the animal had sustained a fractured pelvis which included a transverse fracture through the centre of the right acetabulum. X-ray examination revealed some separation at the site of the fracture but no gross displacement of the parts. The animal recovered rapidly from the general and the acute local effects of the injury and was discharged from hospital 24 days after her accident. She still suffered, however, from crippling lameness in the right hip as a result of the injury and as the condition showed no further signs of improvement after 2 months, she was then readmitted to hospital and excision arthroplasty was performed. Satisfactory progress was made and her leg was in good use when she was discharged 15 days after the operation. I have been unable to follow this animal's history since I last attended it in 1954.

Case No. 7. This animal was presented at the British Veterinary Association Congress at Glasgow in 1960 by Mr. A. MacLennan of Inverness. A summary of the case history given by him was as follows: Black Miniature Poodle dog, born on March 17th, 1959, and purchased at 9 weeks of age. The animal was normal and active until just under 5 months old when pain was noticed on rising, sitting, lying down, and on moving. There was no history of any accident or injury. Examination revealed that the heads of both femurs moved readily into and out of the acetabulum. According to the classification by Schnelle (1959) this animal had a fourth grade dysplasia. The pain evinced by manipulation was not nearly so acute as that shown on rising. X-ray examination confirmed that bilateral hip dysplasia was present and that complete luxation of both hip joints was occurring. The condition was considered to be a congenital hereditary disease. The prognosis given was very grave. Symptomatic treatment was adopted; the owner was advised to restrict exercise, sedatives were given to control the pain and it was hoped that false joints might form which would improve the condition. The reverse was, in fact, the case. The patient, now 6 months old, had become more and more unable to use the hind legs, pain was more persistent and it appeared that this hopeless cripple would have to be destroyed on humane grounds.

At this stage the writer was consulted by Mr. MacLennan and it was agreed that excision arthroplasty would give the best prospects of a successful outcome. A bilateral operation was performed on September 17th, 1959, and the animal was discharged from hospital 15 days later. By then he was running fast, willingly and relatively free from pain. His subsequent progress was excellent and he now enjoys an active life and to all, except the professional critic, he appears to be quite normal.

Operative Technique

The operation is conveniently performed under general anaesthesia or under narcosis supported by a spinal nerve block. Figs. 1 to 5 show the stages of the operation. They were prepared from a cadaver.

The surgical procedure was as follows: with the patient in a lateral recumbent position and with appropriate preparation a skin incision was made, commencing at a point about ½ inch above and in front of the greater trochanter of the femur and extending downwards for about 3 inches parallel to the long axis of this bone (Fig. 1). The incision exposed the muscular part of the tensor fasciae latae which was cut or split in the direction of its fibres. Deep to the tensor fasciae latae there were exposed a triangle bounded anteriorly by the rectus femoris, posteriorly by the femur and the vastus lateralis muscle and dorsally by the gluteus medius muscle.

By blunt dissection between the rectus femoris and the vastus lateralis and by following the neck of the femur, the hip joint was reached and the capsular ligament exposed (Fig. 2). At this stage better access is obtained if use is made of a retractor or retractors. An incision was made through the accessible part of the capsular ligament close to and parallel with the margin of the acetabulum so that the joint cavity was exposed as widely as was conveniently possible (Fig. 3). The incision usually results in the anterior half of the joint cavity being opened. By turning the stifle outwards, the femoral head was rotated so that the round ligament was accessible for cutting either by a solid scalpel or a rounded bone gouge (Fig. 4). (The round ligament is usually ruptured in cases of dislocation of the hip and it is frequently absent in hip dysplasia.) The head of the femur, now freed and more fully exposed, was removed (Fig. 5). In sectioning the bone the aim is to cut the neck transversely either intracapsularly or extracapsularly, ensuring that no sharp spicules or fragments are left attached to the femoral stump or in the wound. In cases of aseptic necrosis the bone is usually soft, and bone-nibbling or gouge forceps are all that is required to cut through the neck of the femur. When the bone is more dense, bone-cutting forceps or even a bone chisel may be required. The operation is completed without making any attempt to close the joint cavity but by stitching the wound in the tensor fasciae latae with a single layer of continuous medium chromic catgut (2/0), and the skin by a non-absorbable and non-absorbent thread.

Discussion

The results of the 7 cases treated by excision arthroplasty were considered under the following headings—healing of the wound, rehabilitation of the limb, duration of subsequent soundness and the opinion of the owner. The criteria required for an operation to be considered successful were: primary union of the operation wound, reasonably early return of satisfactory functional use of the limb(s), sound subsequent use of the limb(s) (minimal evidence to support success, 1 year), and an opinion from the owner that the operation had been successful. On this assessment cases numbers 1, 2, 3, 4 and 7 were successful. With case number 6, although the final result of the treatment was unknown, because the wound healed satisfactorily and the patient made good post-operative progress, the result was regarded as a partial success. Case number 5 was classed as a failure as the only favourable feature was the healing of the operation wound.

A review of the literature shows that a wide range of operations has been used in an endeavour to restore function to such problem cases. Successful results have been reported by many workers. Singleton (1958) records that in the treatment of aseptic neurosis, multiple drilling of the femoral head or a stainless steel prosthesis are frequently successful. In the treatment of luxations, particularly recurrent luxations, Schroeder (1933) has used a Thomas splint. Lacroix and Riser (1957) have recommended the judicious employment of a wooden or a rubber mallet to bruise the tissues surrounding the joint capsule. Olsen (1957) uses a ball and socket appliance fixed to the femur and secures this by connecting rods to the ileum and ischium. Stader (1939) describes a similar method, but he uses a supporting rod instead of the ball and socket, while Leonard (1960) fixes the joint by a metal toggle through the acetabulum. In the treatment of fractured neck of the femur Nilsson (1941) and Brinker (1957) insert a screw into the trochanter through the neck and into the head of the femur, while Brown (1953) and Archibald and Ballantyne (1953) have used various femoral head prostheses. Leonard (1960) reports that Gorman recommends the use of prostheses "to replace both the femur head and the articular cartilage of the acetabulum" for the following conditions, "osteoarthritis of the joint; aseptic necrosis of the head and neck; congenital luxations and subluxations; intracapsular fractures; separation of femoral epiphysis; fracture of the acetabulum; dysplasia of the head; chronic luxations; coxa plana, coxa vara, coxa magna; tumours of the head and neck."

It is quite evident from the variety of the treatments mentioned above that these workers have found no common solution to the various causes of hip lameness and it is equally evident that many of the treatments used leave room for better results. Brinker (1957) states that the results of fixation have been discouraging, Archibald and Ballantyne (1953) report that pinning of the femoral neck often results in failure of the bone to heal, and Gay (1955), in recording the value of prostheses, states "one year after prosthetic hip operations, only three out of six dogs were using the joint normally." He adds that the true value of the treatment will not be known until the prostheses have been subjected to much longer use.

In view of the above remarks it would seem that, with excision arthroplasty, we have a promising method of treatment for some hip conditions that fail to respond favourably to orthodox treatment. The merits of the operation are, the short and straightforward nature of the surgical procedure, the simple equipment required and the speedy and lasting recovery which usually results.

Conclusion

The cases reviewed in this survey cover the writer's experiences in general practice between the years 1949 and 1954 when the technique and the value of the operation were being explored. It also includes patients treated at the Small Animal Clinic of Edinburgh University School of Veterinary Studies between October, 1959, and December, 1960. It does not include records of patients treated in the 4 years subsequent to 1954, records which are now the property of the successor to the private practice.

The success of the operation is supported by others who have used the treatment, and a report from Mr. A. N. Ormrod accompanies this article (see page 576).

The post-operative X-ray prints of case number 7

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Treatment of Hip Lamenesses in the Dog by Excision of the Femoral Head

BY

A. NOEL ORMROD

Birkenhead

HIND leg lameness in the dog, arising from abnormal conditions of the hip joint, congenital or acquired, provides a constantly recurring clinical problem. The fitting of prostheses as a remedy for the various deformities of the femoral head and open reduction of the persistent hip luxation resulting from trauma have given, at least in the writer's hands, only a very small number of truly satisfactory results.

The treatment of these conditions by the relatively simple operation of excision of the femoral head was first described to the author early in 1958 by Dr. J. S. A. Spreull. Since then the operation has been performed on various occasions and the results have been consistently good. It has proved to be a successful treatment for conditions which, previously, had been most frustrating to the writer, very painful to the patients and disappointing to the clients.

The approach to the joint varies according to the build of the patient. In the case of the lean and "athletic" type of dog the writer follows the same procedure as described by Spreull (1961) which, in these case reports, is referred to as the "anterior approach." In the heavily built animal an approach that gives access to the dorsal rim of the acetabulum (the "dorsal approach") is used. Although this method involves much more interference with the muscles it gives a more open access to the joint. For making the actual transection behind the femoral head, a Gigli wire, whilst somewhat laborious and requiring a certain knack in use, gives a very accurate and smooth finish to the stump.

Method Employed in the Dorsal Approach

The incision, which must be of adequate length, commences 1½ to 2 inches medial to the centre of the summit of the great trochanter. It passes over the summit to terminate an inch or so below the estimated position of the rudimentary third trochanter. The subcuticular fat is divided carefully until the outer surface of the middle gluteus and the line of fusion between the tensor fasciae latae and the anterior edge of the biceps femoris can be recognised.

Scissors are used to divide the biceps from the fasciae latae along the line of fusion. Retraction reveals the insertion of the superficial gluteus on the third trochanter (linea aspera). This aponeurosis of insertion is easily divided so that sufficient "hold" is left for suturing later. This muscle is now reflected and if the underlying pyriformis can be identified separately it is dealt with in a similar way. The insertion of the middle gluteus into the great trochanter is now visible.

By blunt dissection (preferably using the finger tip), the belly of the middle gluteus is freed along and under the lower border from the outer surface of the deep gluteus until the position of the sciatic nerve is accurately determined. The insertion of the middle gluteus is now divided and the muscle is retracted.

The deep gluteus is now available and is detached close to the insertion in the great trochanter.

The joint capsule can now be seen and through it can be felt the dorsal arch of the acetabulum. After incision of the capsule dis-articulation can be completed with the aid of strong curved scissors and/or a small bone gouge. This is made easier if the limb is suitably manipulated by an assistant.

Excision Arthroplasty as a Method of Treatment of Hip Joint Diseases in the Dog.—*Concluded.*

(Figs. 6 and 7) show that the femurs in relation to the pelvis are situated higher and that there is no evidence of new bony articulation.

That a dog is not handicapped by such a synsarcotic joint (muscular union) is explained by the fact that most of its weight is supported by the fore limbs with the result that loss, or some loss of stability in the hind limb(s) does not have the disadvantage that it has in man, where such treatment merely substitutes one form of lameness for another. Similarly, in the case of the single operation where the affected limb is made shorter than its neighbour, shortening is unimportant, because a dog's hind leg is angulated and treatment that moderately shortens a limb merely results in some compensating alteration of joint angles.

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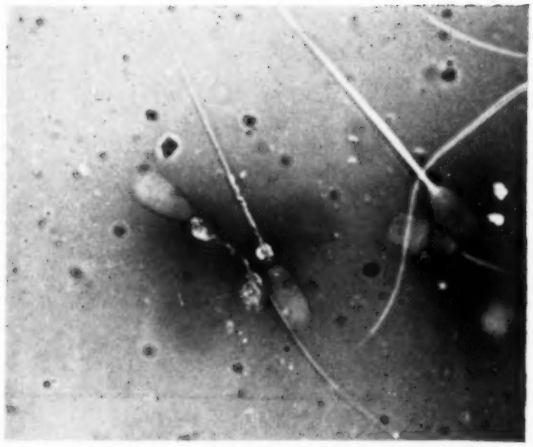
A. NOEL ORMROD.—TREATMENT OF HIP LAMENESSES IN THE DOG BY EXCISION OF THE FEMORAL HEAD

FIG. 1.—Dysplasia of both hips in a Yellow Labrador bitch.

I. B. MUNRO, D. L. STEWART & D. R. MELROSE.—MIDDLE PIECE DEFECT IN BOVINE SPERMATOZOA



Microphotograph showing two sperm with middle piece defect and protoplasmic droplets (approx. 1,000 diam.)

After attention to the femoral head the divided muscles are sutured in turn to their respective tendons of insertion. The biceps femoris is re-united to the fasciae latae and the wound is closed in the normal fashion. It is not necessary to suture the joint capsule. The writer has used linen thread, and/or braided nylon for suturing the gluteals to their insertions and medium chromic catgut, size B.P.1 or B.P.0, for the biceps/fasciae latae suture line.

The writer has not made a practice of advising post-operative passive exercise, massage or manipulation with either the anterior approach described by Spreull or the dorsal approach described above.

Case Reports

(i) Yellow Labrador, male, aged 11½ months. History of constant hind leg lameness, more pronounced on the left side. Radiography showed bilateral hip dysplasia. The left femoral head showed a much greater degree of deformity than the right one. In October, 1958, using the dorsal approach, the left femoral head was excised. When the skin sutures were removed 10 days later the limb was in careful use. After a further 3 weeks the lameness had virtually disappeared. This dog came from a distant town and the last news of him was received from the owner at Christmas, 1960, when there had been no return of the lameness. The writer remains curious about the right hip and hopes to have the opportunity of taking a new radiograph in the near future.

(ii) Yellow Labrador, bitch, aged 9 months. No familial connexion with case No. 1. Bilateral hind leg lameness first noticed at 4½ to 5 months. Radiography showed dysplasia of both hips to an equal degree (see Fig. 1). The left femoral head was excised early in November, 1958, and the lameness in this limb disappeared in one month after the operation. The right limb was treated similarly in March, 1959, and the dog was entirely free of lameness in a further 3 weeks. The dorsal approach was used for both operations. This dog lives locally and is seen frequently; it remains quite normal in its carriage and in its behaviour.

(iii) Cairn Terrier, male, 13 months. Persistent and painful lameness of the left hip. Hip and thigh muscles greatly atrophied. Radiographs showed marked deformity with rarefaction and disintegration of the left femoral head. Excision was performed in January, 1959, using the anterior approach. Lameness disappeared inside 8 weeks. This dog still remains free of lameness.

(iv) Terrier type puppy, male, 5½ months. Luxation of femoral head resulting from a road accident. Reduction of the dislocation under anaesthesia was easy but it proved quite impossible to prevent redislocation on recovery from anaesthesia. Using the anterior approach the head of the femur was excised in April, 1959, about 4 days after the injury had been sustained. The puppy made a good recovery and has suffered no further inconvenience.

(v) Miniature Poodle, male, 16 months. History

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Middle Piece Defect in Bovine Spermatozoa

BY

I. B. MUNRO, D. L. STEWART and D. R. MELROSE

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THE presence of spermatozoa showing a characteristic coarse and irregular helix formation in the mitochondrial sheath described by Blom (1959a) as "corkscrew sperms" was found in the semen of a 6-year-old Jersey bull. This, the main abnormality, was present in 8 to 19 per cent. of spermatozoa in samples from the bull during a period of 11 months. The total abnormality incidence varied between 28 and 46 per cent. and there was a gradual decline in the motility ratings of the semen, which was considered eventually to be unfit for use in artificial insemination. Unlike 2 cases described by Blom (1959a) there was no reduction in spermatozoal density; also the semen, diluted at the rate of 1 in 50, did not show any decline in fertility. The 16-week non-return conception rate was 57 per cent. from 564 first inseminations during the first 6 months of the above period.

The abnormality was identified in stained spermatozoa which in addition possessed proximal protoplasmic droplets, as seen in the accompanying photograph, when stained by the nigrosin-eosin method. The type of the abnormality was confirmed in smears examined by Blom (1960b). Some of the spermatozoa also showed partial absence of the mitochondrial sheaf or accumulation of mitochondrial material at one point of the middle piece, similar to the middle piece abnormalities described by Bretschneider (1955) and Fujii (1958). Further details of the structural changes in affected spermatozoa, revealed by the electron microscope, have been provided by Blom (1959b). Blom suggested that a high incidence of such abnormal spermatozoa, especially with older bulls, should be regarded as indicative of the existence of degenerative change in the testes.

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Treatment of Hip Lamenesses in the Dog by Excision of the Femoral Head.—*Concluded.*

of extremely painful lameness of the right hind leg with severe muscle atrophy. Much medical and manipulative treatment had been applied for many months and the dog had become peevish and resentful and quite vicious when the limb was handled. Radiography showed extensive rarefaction and disintegration of the right femoral head. This was excised in July, 1959, *via* the anterior approach. Recovery in this case was slow but steady. Six weeks after the operation all pain had gone but the limb was only being used as a crutch. By the end of October the limb was in full use. The atrophied muscles had developed and there was no resentment when the limb was examined thoroughly.

An Outbreak of Equine Ringworm due to *Trichophyton equinum*

BY

MARY P. ENGLISH

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SUMMARY.—An outbreak of equine ringworm due to Trichophyton equinum *is described. Eighteen out of* 19 *stabled animals contracted the disease, as did* 3 *horses at grass. Four out of the* 7 *people who were at risk were also infected. Some aspects of the epidemiology of the disease are discussed.*

RINGWORM due to *Trichophyton equinum* is not uncommon among riding horses in this country, yet, apart from a brief description by Ainsworth and Austwick in 1955, there are no recent accounts of outbreaks. In one which occurred in the West Country in the late summer and autumn of 1960 it was possible to obtain a fairly detailed history, and the following account may, therefore, be of interest.

Animal Infections

Course of Outbreak

At the time of the outbreak there were 18 stabled horses and a number of other animals turned out in fields at varying distances from the stables. All the animals except a stallion and one of the horses at grass were 6 years old or under. They comprised horses and ponies for riding purposes. Stabling and management were excellent and the animals were all free of skin disease.

On August 24th, 1960, a new and apparently healthy horse was introduced into the stables: 7 days later, it was apparent on clinical grounds that this animal had ringworm. Seven to 10 days after this, the first infected contact was noted. Most of the other stabled horses became infected during September, and by October 14th, 16 of the original 18 had contracted the disease, as had 3 of the animals at grass with which stabled horses had been turned out for exercise.

On November 14th, one month after the last new case, the 17th animal, a foal of about 8 months (the only one in the stable), was found to be lightly infected. The 18th stabled animal, the stallion, was turned out with 6 mares in a distant field about a fortnight after the beginning of the outbreak, and both he and the mares escaped infection.

Clinical and mycological observations

On October 14th, 2 months after the arrival of the infected animal, scrapings were taken from 4 horses, as follows:—

Horse D was one of 2 with lesions of the head and neck only. The infection was first noticed on September 14th and was clinically cured at the time the scraping was taken. No fungus was found on microscopy or culture.

Horses M and B, first seen to be infected on September 22nd and 27th respectively, had lesions of the saddle and girth area from which the scabs had been shed, but there was still some loose, matted hair. No fungus was found on microscopy or culture.

Horse L was found to be infected on September 19th. Lesions of the girth area were similar to those of horses M and B, but there were also numerous discrete lesions on the neck. Scrapings were microscopically positive and yielded *T. equinum* in culture.

As has been stated, the foal became infected a month later than any other animal. Scrapings from the minute lesion on its nose were obtained on the day this was first seen and *T. equinum* was isolated. Ten days later no fungus could be found and 4 days after that the lesion had disappeared. On the same day, however, the scab from a small lesion on the near fore knee was examined and yielded *T. equinum* in abundance. This lesion was clinically apparent for about 2 weeks.

Of the 18 stabled animals which contracted the disease, 15 had it severely, with involvement of the girth area, and were off colour for 2 to 3 weeks. All these horses had been ridden regularly. The remaining 2 adult horses were infected on the head and neck only: at the time of the outbreak they were being lunged, not ridden.

Precautions and Treatment

As soon as the disease was recognised, all riding,

Middle Piece Defect in Bovine Spermatozoa.—*Concluded.*

A few spermatozoa (1 to 4 per cent.) showing the defect were observed in the semen of 8 out of 43 bulls examined over the past 2 years and in these also there was no apparent reduction in fertility. Blom (1960a) in an examination of semen from 1,788 Danish A.I. bulls between 1943 and 1959 found the defect at levels over 2 per cent. in 9 bulls aged 1¼ to 11 years. At least 7 of the bulls had shown lowered fertility or sterility. It would appear from the above observations on bulls at this Centre that, while a high incidence of the middle piece defect might precede a fall in semen quality, a low incidence of up to 4 per cent., as with other abnormalities of spermatozoa, does not necessarily precede such a change.

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grooming and clipping were stopped. Only one person attended to the infected horses until the numbers were too great for this to be practicable. Hands and boots were dipped in strong disinfectant*, between handling each horse.

For treatment, various proprietary fungicides were tried which, with the possible exception of one†, had little effect. The animals were therefore scrubbed down with a strong solution of detergent‡ to remove as soon as possible infective scab and loose hairs.

As each animal recovered, its stall was thoroughly disinfected and whitewashed, and its rug washed with strong disinfectant, as were saddles, bridles and grooming kit.

Human Infections

Seven human contacts were at risk, all female, and comprising 5 adults and 2 children. Two of the adults and both children became infected, all about 6 weeks after the beginning of the outbreak in the horses. All the lesions were small, red and scaling, and no secondary infection occurred.

The adults' infections were not seen by a doctor, but the patients' descriptions, and the onset during the outbreak in the horses, leave little doubt of their nature. All the lesions were about the size of a halfpenny, patient X having one on the arm and one on the leg, and patient Y one on the arm only. Patient X had a recurrence of infection (diagnosed clinically but not mycologically) about 6 weeks after the first attack, lesions occurring on the neck and shoulder. She had had no direct contact with the foal, which was the only animal infected at the time.

Of the children, one aged 12 years had a lesion on the thigh about the size of a penny, first seen at the same time as the adult infections: the other, aged 10 had a very small lesion on the cheek, which appeared a few days later. Hyphae were seen in scrapings from both children and *T. equinum* was recovered in culture from the older one. A liberal application of fungicides prevented isolation from the other child.

The human infections received a variety of local treatments: the 2 children and adult X were also given griseofulvin by mouth. All lesions resolved quickly.

Discussion

The introduction into a stable of equine ringworm through the agency of a new and apparently healthy horse is entirely typical of the disease as caused by *T. equinum* (Austwick, personal communication) and suggests that quarantining of all new arrivals would be a useful precautionary measure.

The entire outbreak, including the recurrence in adult X, lasted for nearly 4 months. Every animal at risk except 1, and 4 out of 7 human contacts, contracted the disease. The only horse to escape was exposed for only a fortnight, but was also considerably older than the others: Brocq-Rousseau, Urbain and Barotte (1927) state that older horses have a greater resistance.

The first infected contact was noted 2 weeks after the arrival of the new horse, but the actual incubation period may well have been shorter, as opportunity for cross-infection did not necessarily occur at once. In any case, the period is well within the reported limits of 1 to 3 weeks (Ainsworth & Austwick, 1959). All the other infections of adult horses occurred within the following 7 weeks: the disease, therefore, ran through the stables with a speed compatible with a short incubation period.

Ainsworth and Austwick (1955) isolated *T. equinum* from 3 horses 8 weeks after infection was first noted. In the present outbreak, one animal was still infective after 35 days, but was not examined again. No fungi were found in 3 others, 29, 32 and 40 days respectively after lesions were first noted, and a minute lesion on the foal was free of fungus in a fortnight. This suggests that, even for one fungus species, the length of time that an animal remains infective can be very variable.

Several routes of cross-infection must have been involved in this outbreak. In the first 7 days, before the disease was recognised in the newly arrived animal, shared grooming kit and saddlery and direct contact between the animals were undoubtedly of first importance. After this, when all grooming, riding and clipping were stopped, cross-infection must have been by less obvious means, for instance, the touching of fences by a healthy horse turned into a field for exercise after an infected one. Horse B and the foal must have contracted the disease by some such means. That the foal remained free of infection for so long was undoubtedly because it was being neither groomed nor ridden at the time of the outbreak. The recent observations of Mackenzie (1961) and of Friedman, Derbes, Hodges and Sinski (1960) on the air dispersal of fungi causing human scalp ringworm, suggest that the dissemination of equine ringworm by this route is also a possibility.

The disease was severe in the saddle and girth area in all but 2 horses and the foal, and these 3 animals were the only ones not being ridden at the time of the outbreak. As riding of all horses was stopped as soon as the first case of ringworm was recognised, and the last horse did not contract the disease until 7 weeks later, it seems that the friction of a saddle worn even several weeks before infection takes place can predispose this area to infection (Batte & Miller, 1953).

The widespread nature of almost all the equine infections may possibly have been due to treatment by scrubbing down to remove the scab. Austwick (personal communication) suggests that this might serve to spread infection over the body, and that sponging down with the detergent might have been more satisfactory.

Human infections with *T. equinum* are unusual. (Georg, Kaplan & Camp, 1957; Austwick, personal communication). In this outbreak they did not occur until most of the horses had contracted the disease, by which time the inoculum potential in the stables must have been considerable. It is unfortunate that the apparent recurrence in adult X was not proved

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* Jeyes' Fluid.
† Root's Ringworm Ointment.
‡ Daz.

Current Literature

ABSTRACTS

Therapy of Experimentally Produced Bovine Cutaneous Papillomatosis with Vaccines and Excision. OLSON, C., & SKIDMORE, L. (1959). *J. Amer. vet. med. Ass.* **135.** 339.

Cutaneous virus papillomatosis is a relatively benign neoplastic condition, other manifestations of which are fibropapillomatosis of the external genitalia and papillary tumours of the urinary bladder in cattle, and sarcoma-like lesions of the skin of horses. The condition is self-limiting but little is known about the rate of growth and regression under field conditions, or whether intervention by vaccine therapy or the excision of some warts is worth while. In an attempt to clarify the position 60 Hereford calves aged between 8 and 9 months, in good physical condition, showing no evidence of papillomatosis, were inoculated on scarified skin with 5 per cent. suspension of ground bovine wart tissue. The wart growth thus produced was measured and was considered to have reached its peak by about the 91st day.

To test the efficacy of vaccination 25 ml. of 2 commercial formalin-inactivated wart vaccines was injected subcutaneously into 52 calves, together with 2 ml. intradermally into a caudal fold. When wart vaccine was given to calves at the 35th day the warts became larger than those of the 8 controls and of those subsequently treated at the 63rd day. Vaccine given at the 63rd day appeared to produce larger warts than those in the calves treated at the 91st day, in which group some wart growth was observed after vaccination.

Of a further 60 calves infected in the same way 10 suffered surgical excision of half of the experimental warts at the 40th day, 8 one-fourth, and 5 one-half, at the 73rd day, 3 one-fourth, and 5 one-half at the 100th day. The warts remaining in the first group grew faster and lasted longer than those on the controls and a significant number of re-appearances occurred. The excision of some warts at 73rd and 100th days seemed to be followed by moderate regression of the remainder, with some re-appearance.

The writers conclude that wart vaccine, given at any stage of growth, is liable to increase the size of warts, and that the surgical excision of some warts to accelerate the regression of others is not only valueless but unwise.

J. P.

Continued Progress Toward Controlling Bloat—A Review. COLE, H. H., & BODA, J. M. (1960). *J. Dairy Sci.* **43.** 1,585.

After reviewing 189 references the following conclusions are made:—

Physiological

1. The development of normal rumen motility necessitates the presence of roughage in the diet.
2. The usual motility pattern consists of a mixing contraction, initiated in the reticulum and sweeping posteriorly, followed, either after each mixing contraction or after every second mixing contraction, by an eructation contraction which moves the pocket of free gas anteriorly to the cardia.
3. Motility of the rumen and reticulum is not myogenic, but depends upon efferent impulses.
4. Salivary flow is increased by scabrous foods. Individual differences in flow rate have been observed.

Aetiological

1. Excessive foaming is the primary factor which prevents normal eructation. Possibly, foam stimulates sensory fibres which inhibit eructation. Foaming may be due to a lack of scabrous materials in succulent legumes reducing salivary flow, as saliva presumably inhibits foaming, or to the absence, or slowness of release, of antifoaming, lipid-carrying chloroplasts allowing foam to form.
2. Rate of gas production is obviously involved, as the greater the gas production the more accentuated the bloat condition becomes upon failure of the eructation mechanism.
3. Evidence is available to indicate unique microbial populations in animals bloating on legumes. The characteristics of the microflora depend upon little-known dietary influences.

Prevention

1. Use of legume-grass pastures in which grasses predominate.
2. Supplementing legume pasture with high quality grass hays.
3. Cutting and carting legumes to housed animals

An Outbreak of Equine Ringworm Due to *Trichophyton equinum*.—Concluded.

mycologically, but the fact that it responded to antifungal treatment suggests that it was indeed ringworm.

Acknowledgments.—I am greatly indebted to Dr. A. M. G. Campbell for drawing my attention to the outbreak: to the owners, for giving me every facility to investigate it and for supplying much information: and to Mr. P. K. C. Austwick for advice on the preparation of this article.

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will produce bloat as compared to grazing. The cut material should be supplemented with 3 to 5 lb. of grass hay.

4. For short periods of time antibiotics may be useful. The antibiotics may become ineffective after 2 weeks of usage.

5. Antifoaming agents such as plant or animal fats are effective. Administration before grazing will prevent bloat for about 3 hours, but this necessitates limiting the grazing period or feeding the fat 2 or 3 times daily. Bloat may be effectively controlled by spraying strips of legume pasture with oil or emulsified tallow before grazing. Spraying silage with oil has proved highly effective.

Treatment

1. Administration by drench, stomach tube, or direct rumen injection, of antifoaming agents. Animal and vegetable oils are especially desirable because they are non-toxic and well dispersed.

2. Releasing the gas with a trochar and cannula or by a stomach tube.

3. If the above procedures fail, rumenotomy may be performed. J. O. L. K.

Posthitis and Prolapse of the Prepuce of Cattle. DONALDSON, L. E., & AUBREY, J. N. (1960). *Aust. vet. J.* **36.** 380.

In the Townsville district of Queensland, during the four years 1956 to 1959, 25 bulls and 1 steer were affected with posthitis; 20 of these exhibited prolapse of the prepuce. Nineteen cases occurred in Santa Gertrudis bulls, 2 in Santa Gertrudis cross bulls, 3 in Zebu cross bulls, 1 in a Hereford bull, and 1 in a Zebu cross steer.

There are breed variations in the development and "pendulousness" of the sheath, and the incidence of the condition is highest in bulls in which the inner preputial layer of soft epithelium is based on a bulky subpreputial connective tissue; this allows protrusion of the prepuce from the sheath orifice. Another causative factor is the inadequate control of this primary protrusion exercised by some bulls. Prolapse of the prepuce is such that its distal protrusion nearly touches the ground. The exposed mucous surface becomes swollen, dry, cracked and contused, with secondary infection by *C. pyogenes* not uncommon. Affected bulls lose interest in cows.

It is considered that posthitis could be controlled by hand-mating but that this would not be practicable in North Queensland. Treatment with antibiotics is successful if it is initiated before prolapse occurs; early cases of prolapse are also improved. More serious cases of prolapse are treated surgically. The operation is performed under general anaesthesia and is designed to remove the inflammatory tissue and to retain as much as possible of the internal layer of the prepuce. (This "reefing" operation is similar to the one devised by Farquaharson for the treatment of prolapse of the vagina—*Abstractor.*) After-treatment consists of topical antiseptic cream and parenterally administered antibiotic. Healing occurs in about 10 days, and early post-operative mating is recommended. Constriction of the sheath-orifice occurred in 6 bulls and this necessitated a second operation to enlarge the orifice by removing a V of skin about 1½ inches long from the ventral aspect of the orifice.

The authors advise control of this condition by the selection of bulls with small prepuces and with the ability to retract the inner preputial lining.

The Anthelmintic Efficiency of Tetrachlorodifluroethane in Sheep Infested with *Fasciola hepatica.* BORAY, J. C., & PEARSON, I. G. (1960). *Aust. vet. J.* **36.** 331.

The present study is a logical development from Hall's (1921) discovery of the anthelmintic effect of carbon tetrachloride and of Thienel's (1926) announcement of the efficiency of hexachloroethane against liver fluke in cattle; these chlorinated hydrocarbons are not always fully effective against *Fasciola hepatica* and both produce at times severe toxic symptoms and death. Toxicity of chlorocompounds is related to the ratio of chlorine to carbon and is lessened by substitution of fluorine for chlorine in the methane series. Hence, hexachloroethane is less toxic than carbon tetrachloride and tetrachlorodifluoroethane should be even less toxic. The latter compound is used in industry as a chemical solvent under the name of "Freon-112." A 50 per cent. w/v solution of "Freon-112" in liquid paraffin is a stable, water-white liquid and was used to treat 6 groups of sheep infested with *F. hepatica.*

Anthelmintic efficiency was determined by faecal egg counts, all eggs in a 3 g. sample being counted by a method which is more sensitive than Whitlock's flotation technique. "Freon-112" was shown to be highly efficient against mature *F. hepatica* infestations in sheep. A dose of 30 ml. for a 100-lb. sheep—representing 0.15 g. per lb. bodyweight—was administered by a conventional drenching gun; it was 100 per cent. effective against mature flukes, but had a variable effect against immature parasites. Doses 7½ times greater than the recommended anthelmintic dose were shown to be non-toxic and this low toxicity will allow larger doses to be used in further trials of the drug in the treatment of acute fasciolosis associated with immature flukes. G. H. A.

Logetronographie—An Electronic Copying Process (translated title). SCHEBITZ, M. (1960). *Berl. Munch. tierärztl. Wschr.* **73.** 561.

A description is given of an electronic copying process with the "Logetronic" machine (manufactured by Guy Robert & Co., Paris), the principle of which is the production of less total contrast and better detail contrast in roentgenograms. The advantages are explained and examples given (2 diagrams, 8 reproductions of plates). The results are impressive. Further details are in the monograph of Jutras and Fischgold (1958): *Amélioration et Reproduction des Radiographies par Modulation Electronique: Le Logetron.* Publishers of the work are Masson & Co., Paris. A. D. W.

Divisional News

THE YORKSHIRE VETERINARY SOCIETY

The Annual General Meeting was held on February 10th, 1961, in the Hotel Metropole, Leeds, at 2.30 p.m. The President, Mr. W. W. Wilson, was in the Chair.

Thirty-one members and 1 guest were present. Apologies for absence were received from 13 members.

Obituary

In opening the meeting the President referred to the loss the Society had incurred with the passing of Mr. G. H. Locke, an Honorary Associate member, and Mr. W. Andrew, a Life Member. The meeting stood in silence in tribute to their memory.

Minutes

The minutes of the last meeting, held on Friday, October 28th, 1960, were read and signed.

Correspondence

Mr. Donaldson had raised the matter of lack of representation of the profession on the City & Guilds governing body. It had been found that the B.V.A. was in the course of taking up this matter.

A newspaper article sent in by Mr. Brydon, referring to toxoplasma infection of pets and implying a danger of abortion, had been referred to headquarters.

The Society's resolution on facilities for disease diagnosis in pigs was not supported by the Veterinary State Medicine Committee, as it was thought recourse to V.I.O. centres could meet requirements equally well and more information was required on the value of the gel diffusion test.

Other letters from the B.V.A. dealt with proposed Meat Inspection courses and B.V.A. liaison and sub-committees for the current year. Information was also requested about practices in Hull and Middlesbrough to facilitate liaison with the P.D.S.A.

The Editor of THE VETERINARY RECORD had written about the new arrangements for publishing Society minutes and reports. A letter on services by sales representatives was also read.

The steps already taken by the officers of the Society to assist in the organisation of the 1962 Congress at Scarborough were detailed. It was necessary formally to appoint members to the Provisional Committee and Messrs. M. Horrox, A. M. McFerran, W. R. McKinna, P. Y. Stead, G. N. Sutherland, K. G. Towers and W. W. Wilson were nominated.

A letter from the B.V.A. recommending the "Cheshire" scheme for certified crystal violet vaccinated pigs was read. Correspondence was also available from the East Yorkshire Clinical Club. After discussion, it was agreed to approach the N.F.U. and the auctioneers in the 3 Ridings in order to see if a scheme could be organised. It was clear that there was more call for the scheme from the East Riding than elsewhere. The Council of the Society was authorised to take any action required in meeting the various parties if meetings to discuss the scheme became necessary.

Membership

The following were unanimously elected to membership: Messrs. A. Boothroyd, Boston Spa; N. W. Leslie, Boston Spa; W. H. Parker, Thirsk; M. Smith, York; and T. E. Singleton, Thirsk.

Treasurer's Report

The financial statement for the year, having been circulated, was adopted.

Gratuitous Disbursements

It was agreed that the usual donations of 5 guineas each should be granted to the Victoria Veterinary Benevolent Fund, the National Veterinary Benevolent and Mutual Defence Society, and the Animal Health Trust. One guinea was donated to the British Horse Society.

Address

Mr. J. A. Anderson, General Secretary of the B.V.A., spoke to the meeting on the work of head office. He described the increasing prestige of the veterinary profession and of the way in which official bodies were increasingly turning to the B.V.A. for consultation and advice on matters relevant to veterinary science. He also pointed out the various ways in which the B.V.A. was currently looking after the interests of its members: by organising refresher courses, by holding conferences, by issuing handbooks on specialist subjects, and so on. It was noteworthy that co-operation with animal welfare societies was increasing, even in cases where, in the past, it had been noticeably lacking. There was also increasing contact with the national press, radio, and television authorities. Mr. Anderson was most heartily thanked by the meeting for giving an interesting insight into the complicated work of the B.V.A.

Reports of Society Representatives

Mr. Lofthouse, of the A.I. Centre, Burley-in-Wharfedale, reported that essentially business had been as usual apart from some interruptions as a result of foot-and-mouth disease. He said that the Northern Stud Unit to be established at Sheriff Hutton for the keeping of bulls until their female progeny could be assessed would be under Mr. Hunter's control as regards both farm and stock.

Mr. Sutherland, of the A.I. Centre, York, said that no problems had arisen in the last 12 months, and Mr. Hunter and Mr. Couttie continued to support and guard the profession in any discussion on veterinary matters.

No reports were available from the North and West Riding milk sub-committees.

Mr. Dunn, of the East Riding milk sub-committee, said that the main items to report were the curtailing of some activities as a result of foot-and-mouth disease and that attestation had proceeded normally.

Messrs. MacLeish, Leslie, and Donaldson, had nothing to report on the licensing of bulls and control of rams regulations.

Mr. E. R. Moore stated that relations between veterinary surgeons and the Leeds branch of the R.S.P.C.A. had remained good and conditions were satisfactory.

Mr. Sutherland said that all three local practices were co-operating harmoniously with the York branch of the R.S.P.C.A.

Mr. Horrox had kindly provided a résumé of the first year of the East Yorkshire Clinical Club's life, listing the talks which had been given and the arrangements which had been made.

The thanks of the Society were given to all its representatives for the time and work which they had put in on the Society's behalf during the year.

Election of Officers for 1961

The following appointments were made:—

President: Mr. P. Y. Stead; Senior Vice-President: Mr. W. W. Wilson; Junior Vice-President: Mr. W. R. McKinna; Treasurer: Mr. A. J. Adams; Secretary: Mr. K. G. Towers; Auditors: Messrs. W. R. McKinna and G. S. Donaldson; B.V.A. Council Representatives: Messrs. A. J. Adams, G. S. Powley, P. Y. Stead, and K. G. Towers; Social Secretary: F. Lofthouse; Council Members (elected by ballot): Messrs. J. L. Crooks, D. Campbell, E. V. Fawell, M. W. MacLean, A. M. McFerran, Miss Woods, J. F. Harbourne, and F. Lofthouse.

Alteration of Rules

It was agreed that the rules should be amended as proposed on the agenda.

Presidential Address

Mr. W. W. Wilson then gave his presidential address. It was very well received and he was most warmly thanked by the meeting.

Any Other Business

Two members recommended the Craiglands Hotel, Ilkley, as a possible venue for future social functions. It was suggested the Council should reconsider revision of the Guide to Fees.

THE LANCASHIRE VETERINARY ASSOCIATION

A general meeting of the Association was held at the Midland Hotel, Manchester, on Friday, April 7th, 1961, at 7.30 p.m. The President, Mr. R. W. Dye, was in the chair. Sixteen members and 3 visitors were present and apologies for absence were received from 20 members.

Correspondence

A letter from the B.V.A. was read asking that Divisions should not actively promote the initiation of any new schemes for the sale of certified vaccinated store pigs. This was noted.

Membership

The following gentlemen were elected members of the Association:—

Messrs. D. R. V. Crichton, J. E. Foley, G. B. Stubbs, S. Angus, D. W. Kerruish, and R. H. Hawkins, of the Isle of Man; A. S. Wallis, of Liverpool; and P. T. Worthington, of Colne.

Mr. Holroyd said that the decision of the veterinary surgeons in the Isle of Man to join the Association was particularly welcome and he asked if they could be so informed. This was agreed.

"Salmonellosis: a Serious Outbreak in a Dairy Herd"

Mr. D. H. Morton gave a detailed clinical description of an outbreak of salmonellosis in a dairy herd, which he had encountered in the course of practice. The causal organism had eventually been identified as *Salmonella typhimurium* of the same phage type as had been isolated by the medical authorities from human cases in the district. No precise connexion had been established, however, between the outbreak in cattle and the human cases.

Mr. Morton described the history of the affected herd, including the breeding, type of management, and diet. He gave a detailed day by day account of the clinical appearance of the affected animals, how they progressed, differential diagnoses considered in the early stages, *post-mortem* findings in several cases, and the effects of the various lines of treatment that had been adopted. Details were given of the bacteriological examination of milk and faeces during the course of the outbreak and for several months after it has run its course.

It is hoped to submit this paper for publication shortly.

"Some Problems of Small-animal Practice"

Mr. J. W. Heney in the limited time available, discussed briefly many of the problems of small-animal practice. He mentioned clinical problems and some of the organisational problems of practice. The clinical conditions discussed included hip dysplasia in puppies, chorea, toxic pyometra in the bitch, chronic rhinitis in cats, depraved appetite in dogs, dermatitis of the lip folds in the dog, chronic patellar luxation in poodles and other breeds of dog, obesity, and contagious acne.

Discussing practice organisation, Mr. Heney questioned the desirability of domiciliary visits now that roads are becoming increasingly overcrowded. Consultations at the surgery were to be preferred for adequate help, and a full supply of dressings and instruments were then readily available ensuring that the veterinary surgeon's time was more efficiently utilised. On the question of fees the speaker felt that some standardisation of fees was desirable and that it was best achieved by informal discussions between veterinary surgeons practising in the same area.

"Difficulties Experienced by Recent Graduates"

Mr. Peter Nutt gave an interesting and entertaining account of some of the difficulties experienced by him and by some of his acquaintances when they first entered general practice. The recent graduate usually started in practice as the "new assistant" and it helped considerably if the clients could be forwarned that Mr. "Blank" would be visiting them and that he was a perfectly well qualified veterinary surgeon. For the new man a good relationship with the principal was essential; the principal should give him the opportunity to discuss various cases in detail and be ready to give a second opinion in the early stages if necessary. A recent graduate would often be hazy about the cost of treatment, the value of animals, and other economic considerations; advice from the principal on these points would usually be appreciated. The newly qualified did not always realise the importance of humouring the patient's owner particularly in small-animal practice where a high degree of tact was sometimes necessary. These and various other points were discussed by Mr. Nutt who felt that if the recent graduate's problems were more widely appreciated they would not be so formidable.

A lengthy discussion took place on each of the 3 subjects and in conclusion the President thanked the speakers for their very interesting papers, which had resulted in a very stimulating and varied programme.

News and Comment

15th ANNUAL CONGRESS OF THE INTERNATIONAL SCIENTIFIC FILM ASSOCIATION

The above Congress will be held in Rabat, Morocco, from September 16th to 27th, 1961.

It is hoped that suitable veterinary films which have not been shown at previous Congresses will be made available for consideration by the United Kingdom delegate of the I.S.F.A. It would be helpful if full details can be sent to Mr. Lex Hornsby, Scientific Film Association, 3 Belgrave Square, London, S.W.1., and forms may be obtained from Colonel G. V. Short, Veterinary Department Imperial Chemical Industries Ltd., Alderley Park, Macclesfield, Cheshire.

It is the responsibility of the I.S.F.A. Branch in each country to select the films to be shown at the Congress.

TICKETS FOR CONGRESS FUNCTIONS

It was hoped to include with this week's VETERINARY RECORD an application form for tickets to the various Congress functions. Owing to a production difficulty this has been delayed until our next issue, when a full Congress programme will be published also.

THE A. B. MACINTYRE FUND

Further contributions are gratefully acknowledged from:—

Andrew, Mr. A. S.; Brancker, Miss W. M.; Spreull, Dr. J. S. A.; Society of Women Veterinary Surgeons; Serth, Mr. G. W. (omitted from previous list).

The total contributed now stands at £93 12s. 0d.

MR. ROBERT COULTHARD

Mr. A. A. Forsyth writes:—

By the sudden and unexpected passing of Robert Coulthard, Northern Nigeria has lost one of its best known and most respected characters and the writer a friend of over 40 years standing.

An airman in the First World War, the 'plane he was piloting was shot down over the sea near the Belgian coast and he managed to swim ashore where he was taken prisoner. The Germans reported that he was dead and as his repatriation was somehow delayed, he saw on his way home the very nice gravestone erected by his sorrowing relatives to his memory in the churchyard at Heyst. From then until his death his interest in aviation never flagged and there can be few of his contemporary officers left who are capable of passing the necessary tests and renewing their civilian pilot's licence as he did as lately as last autumn.

Coulthard, a bachelor and naturally a nomad, loved life in the bush and open country and he must have been one of the very few Colonial civil servants who consistently refused promotion and its inevitable office work in order to stay in the field among the primitive tribesmen he understood so well and for whom he did so much. Eventually, he reaped his reward for on his retirement from the veterinary service he was appointed the first Game Warden in Northern Nigeria and given the task of forming the newly declared Game Reserve. There he was able to continue to preserve the fauna officially, instead of as before, merely as his lifelong hobby.

The thought of leaving Nigeria and retirement to the British Isles was a nightmare to him and he died as he would have wished, in harness, suddenly and without suffering while at the very top of his form, a very few hours after leaving the writer's house where he had called on one of his periodic and fleeting visits. We buried him with simple ceremony on the next afternoon in the little churchyard of St. Piran's on the Plateau at Jos, within a few miles of where, 34 years ago, his West African career began.

PERSONAL

Marriage

CAMPBELL—MARTIN.—On June 3rd, 1961, Robert Ian Martin Campbell to Heather Martin, M.R.C.V.S., of P.O. Kabete, Kenya.

Births

BOSWOOD.—On May 30th, 1961, to Janet, wife of Bryan Boswood, M.A., VET.M.B., M.R.C.V.S., of 16, Shorter Avenue, Shenfield, Brentwood, Essex, a daughter, Helen.

COLLINSON.—On June 3rd, 1961, at Wallasey, to Gwendolen Hester (*née* Ward), M.R.C.V.S., wife of Jeffreys Collinson, a daughter, Eleanor Gwendolen, sister for Alicia, Jonathan and Timothy.

CROWLEY.—On May 30th, 1961, to Elizabeth, wife of Tony Crowley, B.V.SC., M.R.C.V.S., Field Cottage, Resthaven Road, Wootton, Northants., a daughter.

HAXBY.—On May 31st, 1961, to Barbara, wife of Donald L. Haxby, M.R.C.V.S., at Newark, a daughter, Elizabeth Jane, sister for Joanna and Adrian.

VALLELY.—On June 1st, 1961, at Wolverhampton, to Margaret, wife of Tom Vallely, M.R.C.V.S., a daughter, Lesley Elizabeth.

R.C.V.S. OBITUARY

We record with regret the death of the following member of the profession:—

TINDLE, Robert, Corston, Malmesbury, Wilts. Graduated from the Royal Veterinary College, London, July 14th, 1904. Major, R.A.V.C. (retd.). Died May 30th, 1961, aged 78 years.

COMING EVENTS

June

14th (Wed.). WEST OF SCOTLAND DIVISION. Meeting of the Clinical Club at the University Veterinary Hospital, Bearsden, 7.30 p.m.

16th (Fri.). NORTH OF IRELAND VETERINARY ASSOCIATION. Summer Meeting at Halls Hotel, Antrim, 7.15 p.m.

17th (Sat.). B.S.A.V.A. NORTH-WEST REGION. Meeting at the Queen Hotel, Chester, 7.30 p.m.

19th (Mon.). B.S.A.V.A. METROPOLITAN REGION. Meeting at the Royal Society of Medicine, 1 Wimpole Street, London, W.1.

22nd (Thurs.). ASSOCIATION OF VETERINARY FOOD HYGIENISTS. Meeting at Forfar, Angus (to visit the new slaughterhouse). Members should assemble at the Municipal Buildings, Castle Street, 2.30 p.m.

28th (Wed.). LINCOLNSHIRE AND DISTRICT DIVISION. Annual General Meeting at the George Hotel, Grantham, 2.15 p.m.

September

2nd (Sat.). STREATLEY '58 CLUB REUNION. Annual Dinner at "Ye Miller of Mansfield."

3rd to 9th (Sun. to Sat.). 79th Annual Congress and Exhibitions of the British Veterinary Association at Oxford

7th (Thurs.). ROYAL VETERINARY COLLEGE ASSOCIATION. Annual Dinner during the B.V.A. Congress at St. Edmund's Hall, Oxford.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the date on which disease has been confirmed, followed by the postal address and local authority.

Anthrax

June 2nd, 1961. W. McLanachan, Logan Hill Farm, Cumnock, Ayrshire (Parish Cumnock) (Cattle). AYRSHIRE.

Fowl Pest

May 30th, 1961. D. H. G. Laer, The Lamb and Flag, Longworth, Abingdon, Berks. BERKSHIRE.

May 30th, 1961. J. A. Matthew, Malting Farm, Great Ashfield, Bury St. Edmunds, Suffolk. WEST SUFFOLK.

May 30th, 1961. Joinson & Son, Pendle View Poultry Farm, Clayton le Moors, Accrington, Lancs. LANCASHIRE.

May 31st, 1961. W. J. Page, Corsten, Noak Hill Road, Billericay, Essex. ESSEX.

June 1st, 1961. J. Buckley, 9, Pocket Nook Road, Lostock, Bolton, Lancs. LANCASHIRE.

June 2nd, 1961. C. C. Mumford, Elm Acres Poultry Farm, Horndon-on-the-Hill, Stanford le Hope, Essex. ESSEX.

June 5th, 1961. Pollastra Ltd.; Cransford, Woodbridge, Suffolk. Disease at: Pollastra, Peasenhall, Saxmundham, Suffolk. EAST SUFFOLK.

Swine Fever

May 31st, 1961. J. Holden, Billinge Lane Farm, Newton Road, Billinge, Wigan, Lancs. LANCASHIRE.

May 31st, 1961. H. Rawcliffe, School Farm, Ambleside Road, Little Marton, Blackpool, Lancs. COUNTY BOROUGH OF BLACKPOOL.

May 31st, 1961. J. E. Bradshaw, Corner Farm, South Duffield, Selby, Yorks. YORK, EAST RIDING.

May 31st, 1961. J. Anderson, 27, Weetslade Terrace, Burradon, Dudley, Northumberland. Disease at: Back North Row, Burradon, Dudley, Northumberland. NORTHUMBERLAND.

June 1st, 1961. T. G. Cookson, Bryning Hill Farm, Bryning Lane, Bryning, Kirkham, Preston, Lancs. LANCASHIRE.

June 1st, 1961. Messrs. J. & E. Dickenson, Langley Farm, Holmfirth, Huddersfield, Yorks. YORK, WEST RIDING.

June 1st, 1961. H. L. Broadwith, Glebelands Farm, Aldborough, Boroughbridge, York. YORK, WEST RIDING.

June 1st, 1961. C. Rhodes, North Farm, Gilding Wells, Sheffield, Yorks. YORK, WEST RIDING.

June 2nd, 1961. D. C. Jones, Llwynymapsis, Morda, Oswestry, Salop. SHROPSHIRE.

June 2nd, 1961. G. Park, Aldbrough House, Aldbrough St. John, Richmond, Yorks. YORK, NORTH RIDING.

June 5th, 1961. H. May, Westcote Farm, West End, South Cave, Brough, Yorks. YORK, EAST RIDING.

June 5th, 1961. J. C. Bickford, The Hawthorns, Littywood Lane, Bradley, Stafford. STAFFORDSHIRE.

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

SCIENTIFIC

The So-called Cat and Dog Strains of *Ancylostoma caninum*

Sir,—*Ancylostoma caninum* has frequently been recorded as a parasite in the cat, especially in tropical and subtropical countries. There is, however, an increasing accumulation of evidence to show that the *Ancylostoma* species of cats which bears 3 teeth on either side of the ventral margin of its buccal capsule is not the same as *A. caninum* (Ercolani, 1859) of dogs, but a distinct species—*A. tubaeforme* (Zeder, 1800).

That the 2 species are distinguishable on morphological grounds was shown by Biocca (1954) in Italy and confirmed by Rohde (1959) in Germany. Rohde also demonstrated experimentally that only very few *A. caninum* larvae from dogs developed to the adult stage in the cat and then never reached sexual maturity and that the same was true for *A. tubaeforme* in the dog.

I have collected *Ancylostoma* material of this type from many naturally-infected cats and dogs in Nyasaland and have recently, through the courtesy of Mr. A. J. Bearup of the University of Sydney, received similar material from Australia. In all these cases the cats were infected exclusively with *A. tubaeforme* and the dogs with *A. caninum*.

It would seem that, under natural conditions, no cross-infection takes place. In Blantyre, Nyasaland, where both species of hookworm occur, each is confined to its own host. In Calcutta, India, Chandler (1925) reported that the dogs are infected with *A. caninum* yet the cats are free of this worm (presumably because *A. tubeaforme* does not occur there); conversely, in parts of Campobasso, Italy (Sagesse in Biocca, 1954) the cats are infected with *A. tubaeforme* but the dogs are free of a hookworm with 6 ventral teeth since, presumably, *A. caninum* is absent in those areas.

There are many minor features which serve to distinguish the 2 species, but the most outstanding

are that in the male of *A. caninum* the spicules never attain a length of one millimetre (between 0.8 mm. and 0.95 mm. long) whereas in *A. tubaeforme* the spicules are consistently longer than one millimetre (between 1.23 mm. and 1.4 mm. long) and that the oesophagus in *A. caninum* is relatively longer (*e.g.* in a female with a body length of 12.0 mm. the oesophagus was 1.10 mm. long) whereas in *A. tubaeforme* it is relatively shorter (*e.g.* in a female 12.5 mm. long the oesophagus was only 0.83 mm. long).

A. tubaeforme in cats causes anaemia, diarrhoea, and loss of condition. Vomiting may occur. The faeces are semi-liquid, are exceptionally foetid and may contain flecks of blood.

Yours faithfully,
W. M. FITZSIMMONS.

Commonwealth Bureau of Helminthology,
The White House,
103, St. Peter's Street,
St. Albans,
Herts.
May 28th, 1961.

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GENERAL

Possible Fat Intoxication in Chickens

Sir,—We would like to draw attention through your columns to the recent appearance in several broiler flocks of a condition which appears to be identical with the syndrome reported in the U.S.A. by Sanger *et al.* (1958) and Schmittle *et al.* (1958), the cause of which has been thought to be some unidentified toxic substance present in the fat fraction of the diet. Machlin *et al.* (1959) and Dunahoo *et al.* (1959) have described similar symptoms in young chickens, laying hens and pullets which result from the feeding of natural and semi-synthetic diets containing toxic fats.

The present series of cases has been characterised by high mortality amongst broiler chickens up to 7 weeks of age. The symptoms develop rapidly in increasing numbers of birds once a particular group is affected. The birds cease to feed, crowd together under the brooders and may emit intermittent plaintive squeaking sounds. Many of the birds which die show no prior symptoms although a few exhibit gasping. There may also be incoordination of the limbs, head and neck for a short period before death. In addition a watery white scour may be present.

On *post-mortem* examination most birds exhibit a severe hydropericardium with sufficient ascites present to cause gross distension of the abdomen. The lungs are usually oedematous and there may also be some subcutaneous oedema. The liver shows varying degrees of degeneration and occasionally has a layer of fibrin over the ventral surface. A small number of carcases show no hydropericardium but instead, an accumulation of white caseous pus around the heart. There is usually an inflammation of the duodenum but no extensive enteritis. The digestive tract is usually empty.

In all the cases investigated to date there has been added fat in the diet. Feeding trials and fractionation of the ether-soluble material from these diets are being carried out, the results of which will be published later.

Yours faithfully,
C. C. WANNOP,
L. G. CHUBB.

Houghton Poultry Research Station,
Houghton,
Huntingdon,
June 6th, 1961.

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The Dave Douglas Fund

Sir,—Contributors to this fund will be pleased to learn that £200 has already been paid over to Dave's widow. As donations are still trickling in from all over the world, Martins Bank Ltd. have kindly agreed to keep the Fund Account open for another month and will accept contributions c/o Martins Bank, Myrtle Street, Liverpool, 7, made out to The Dave Douglas Fund.

Yours faithfully,
PETER O. RANDLE.

8 Mersey Road,
Liverpool, 17.
June 1st, 1961.

Exchange of Students During Vacation

Sir,—Thank you for publishing my letter in THE VETERINARY RECORD of May 20th. Since then several veterinary surgeons have written to me offering to take foreign students and we are now within striking distance of our target.

However, we still require 6 more places for foreign students coming from Switzerland and Germany. Offers to receive them on a paying-guest basis so that they may see British veterinary practice should be made to me at the address below. My colleagues and I are most anxious to accommodate these fellow students all of whom speak English.

Yours faithfully,
E. P. MOUNT.
Vice-president, I.V.S.U.

Students Union Society,
Hawkshead House,
Hawkshead Lane,
North Mimms,
Hatfield, Herts.
June 4th, 1961.

An Operation for the Treatment of Congenital Bilateral Total Cataract in a Thoroughbred Colt

Sir,—Since distorted articles about this operation have appeared recently in the Press there may be some advantage in presenting a short factual record now, rather than waiting for a final outcome of the case.

The subject was a Thoroughbred colt foal born in 1959 to a mare belonging to Miss Norah Wilmot. When the foal was about 5 months old, Mr. R. Hopes, M.R.C.V.S., happened to glance at the foal's eyes and thought the lenses looked white. Pursuing this observation it was found that both lenses were quite opaque. Up to that time no behaviour indicating blindness had been noticed by anyone in contact with the foal, but thereafter it was observed that the foal moved rather more cautiously than the other foals he was running with. It seems likely that he was making good use of such light and shade as he could appreciate around the edge of the lenses. At no time did he use his ears in the exaggerated manner seen in horses that are quite blind.

Sir Benjamin Rycroft, who among his many other distinctions, is consultant ophthalmic surgeon to the London Zoological Society, was asked by the writer to see the case. He considered it to be one of congenital bilateral total cataract. He agreed to operate on the animal with the object of providing direct vision. The operation was to be in 2 stages; the first, to expose the opaque substance in the lens to the digestive action of the aqueous humour, and the second stage to make a pupillary gap.

In June, 1960, when the colt was just over a year old, after treating the eyes for 10 days with Chloromycetin and atropine ointments, the animal was anaesthetised by Mr. Hopes and the writer by intravenous injection of magnesium sulphate, chloral hydrate and pentobarbitone sodium. Deep anaesthesia was obtained, the colt remaining tranquil throughout the operation. There was no corneal reflex. Respiration was reduced to 5 or 6 breaths per minute. Sir Benjamin Rycroft, assisted by Dr. A. Werb, then penetrated the right eye at the lower lateral corneal margin with a standard sized discission needle which was directed to pierce and rupture the anterior aspect of the lens capsule to allow the aqueous humour to act upon and absorb the opaque lens or cataract. A blunt-ended cannula was then put into the anterior chamber and with a hypodermic syringe attached to the cannula about 0.5 ml. of the opaque substance was withdrawn. This resembled rather heavily curdled milk. The animal was turned over and the left eye was similarly treated. The actual operating time was about 20 minutes. The colt rose to his feet after 4 hours. The eyes were treated by instilling atropine, Chloromycetin and hydrocortisone ointments. No dressings were used. Recovery was uneventful. Observation was kept on the eyes to anticipate a secondary glaucoma but this did not occur. There was no apparent improvement in the animal's sight.

The second stage of the operation was carried out 6 months later, in December, 1960. Preparation and anaesthesia were as before and the same team cooperated. A capsulotomy knife-needle was inserted into the anterior chamber of each eye and the considerable quantity of opaque material, the capsule remnants, was separated and manipulated to produce a pupillary aperture.

At the present time (June 3rd, 1961) the left eye has a large clear area through which the retina can been seen with an ophthalmoscope. The right eye has a smaller central clearing and 2 small clear spots. The animal now has some direct vision and can avoid obstacles. It is difficult to assess the amount of improvement in the sight. The right eye is considered to be the more efficient one by the stable staff. They ride the colt at exercise on the roads and he is doing fast canters on the gallops. There is no intention of racing him this year but the question of running him in 1962 is being considered. It is possible that a further operation may be undertaken to improve the pupillary gap in the right eye.

Yours faithfully,

A. C. FRASER.

P.S. Sir Benjamin's fee in this matter was two bottles of sherry.

Woodside,
Chestnut Avenue,
Wokingham,
Berks.

June 4th, 1961.

The Future of the Profession

Sir,—Like your correspondent, Mr. Morrow, I am always somewhat hesitant to enter upon what would appear to be a controversial subject and the time is now past when this matter may be of personal interest to me.

Professor White's presidential address to the Lancashire Division upon this very subject, published in a recent issue of THE RECORD, however, puts the points very ably before us.

The following quotation will be found in the 1938 Report of the Interdepartmental Committee on Veterinary Education:—

"The Veterinary Surgeon is the Physician of the farm and the *guarantor* of the nation's food supply. His established title of Veterinary Surgeon obscures his more important functions, which are not only to cure disease among farm stock, but to check the spread of disease, to eradicate it when established and by *advice* on breeding and nutrition to build up a stock as resistant to disease as possible." (The italics are mine.)

Let us openly admit that whatever our particular professional duties may be, we expect some monetary reward for undertaking them. Is it material whether payment is made by the actual owner, some person acting on his behalf, or the national exchequer? We should still give of our best.

Is not the prevention of disease including, of course, advice for this purpose, of more importance nationally than its treatment?

I come into contact from time to time with numbers of private medical practitioners, and whilst many of these were opposed to the National Health

Scheme in 1948, they would to-day most strenuously oppose any proposals which might be put forward for its abolition.

During the post-war years the veterinary profession, has like many other professions, experienced a "boom" period. This has been mainly due to the tuberculosis eradication scheme together with the demand from farmers for antibiotics or other injections as the panacea to all ills.

How many practitioners to-day can, however, recollect conditions prevailing during the early part of this century when country practice was both extremely arduous and badly paid? In those days only town practice, where the horse was the key to transport, provided adequate remuneration. Large studs of cartage horses were supervised on a contract basis, usually on the rate of £1 per horse per annum. In some cases, such as Messrs. Hay's Wharf Cartage Co. Ltd., and the individual railway companies, wholetime veterinary surgeons were employed.

Horses disappeared almost overnight during the early part of the 1920's, and with them the prosperous town practice. Shortly after this in consequence of the "Ottawa" agreement, most arable farms were obliged to turn over to milk production, resulting in overproduction of milk and consequent low prices. I well recollect a farmer having to accept 9d. a gallon for milk in February, 1931, out of which sum 1d. per gallon was deducted for carriage. He could not pay his labourer let alone his veterinary surgeon's account.

Farming to-day returns the lowest interest for the capital and time put into it. It is stated that if Great Britain enters the Common Market, as is most probable, this will have a further adverse effect upon agricultural economics. It may well be that once again the profession may be ruminating over overdue accounts.

It is in the national interest that the whole of our agricultural industry should be highly efficient. The N.A.A.S. give advice on the growing of crops and to some extent the husbandry of livestock and poultry, but advice on disease prevention, essentially within the province of the veterinarian, is conspicuous by its absence. At a very conservative estimate, the expenditure incurred in the tuberculosis eradication campaign must have shown a saving, to date, of over 10 times its cost, in eliminating losses in livestock which agriculture would otherwise have incurred.

Diphtheria in children is now a disease of the past, due to free immunisation, whilst whooping cough and polio are also on the decline as the result of immunisation schemes. Were all piglets also immunised free of charge with crystal violet, and calves with S.19, then no doubt swine fever and abortion would rapidly become of academic interest only.

If farmers could call on the profession for general advice or on the onset of disease without regard to the costs, not only could much disease be prevented, but response to treatment would be far more effective, and we should no longer be called upon to perform "miracles."

Yours faithfully,
JOHN K. SHAW.

Public Health Department,
Burnley.
June 2nd, 1961.

Promazine Hydrochloride as a Tranquilliser for Sows

Sir,—May I endorse the observations of Mr. Sinclair on the use of promazine hydrochloride in the parturient sow, with its quite dramatic effect. Another use of this drug may interest your readers, particularly potential members of the proposed Veterinary Cinematographic Society. The Pig Industry Development Authority recently enlisted our help in filming a particular sequence, as the average pig was somewhat camera shy or just not interested. I was presented with a 6-month-old Large White gilt in excellent condition, who was singularly unimpressed with the proceedings, and seemed interested only in escaping from the location *via* a back exit. The injection of 250 mg. of promazine hydrochloride ("Sparine") into an ear vein produced a marked change in a very short time. She became almost co-operative, and while the cameras were working, played her part just as though she had read the script, and the scene was shot successfully. I would recommend that the manufacturers (John Wyeth & Bros. Ltd.) include this drug on their Therapeutic Index under Temperamental Film Stars, Female, and see whether this drug can effect a reduction in the cost of producing the latest screen epics.

Yours faithfully,
R. F. JOHNSON.

50 Hempstead Road,
Watford,
Herts.
June 4th, 1961.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN
Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period		Anthrax	Atrophic Rhinitis	Foot-and-Mouth	Fowl Pest	Sheep Scab	Swine Fever
1st to 15th May, 1961		4	—	—	33	—	46
Corresponding period in	1960	9	—	3	92	—	37
	1959	6	—	5	17	—	40
	1958	10	—	—	17	—	48
1st January to 15th May, 1961		90	—	101	545	—	442
Corresponding period in	1960	111	—	14	1,177	—	398
	1959	104	—	7	311	—	430
	1958	77	3	110	259	—	409